

September 2, 1957 50 cents

AVIATION WEEK

A McGRAW-HILL PUBLICATION

Helicopters Lick
Terrain in Hunt
For Oil Fields



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*he's watching the progress of
the Air Age from his machine...*



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AVIATION CALENDAR

Aug. 31-Sept. 3—Midwest Chapter Rides, Itasca, Ill.

Sept. 1-2—12th Biennial International Aeronautical Conference, Royal Aeronautical Society and Institute of the Aeronautical Sciences, London and Teddington, England.

Sept. 1-2—Eighth Annual Flying Derby, Society of British Aircraft Constructors, Farnborough, England.

Sept. 5-14—11th Canadian Assembly International Union of Engineers and Geophysicists in association with Internat'l Geophysical Year, University of Toronto, Canada.

Sept. 7—Second Annual Convention of the UK CAA Club Hotel Plym, Kinsale, Co. Cork.

Sept. 8—11th Biennial Annual Course on Instrument Flight, Royal Aeronautical Society, Farnborough, England. Cost, £10.

Sept. 9-11—15th Annual Meeting Electron Microscopy Society of America, Miami Beach, Institute of Technology, Calif., Los Angeles.

Sept. 9-18—11th Annual Instrumentation Conference and Exhibit, Clevedon, Ohio.

Sept. 10-11—Hudson Regional Science Assembly, Staten Island, New York City.

Sept. 13—Seventeenth Space Flight Meeting, Research Foundation, Stevens Institute of Technology, Hoboken, N.J., American Museum of Natural History, Central Park West, 47th St., N. Y., N.Y.

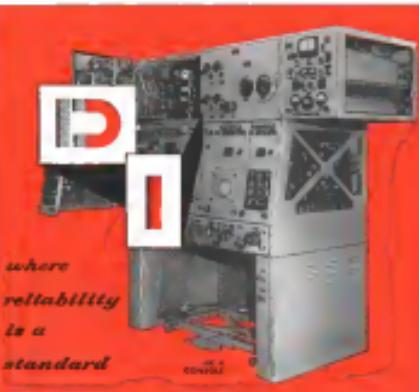
Sept. 13-15—Third Annual West Coast National Meeting, American Society of Mechanical Engineers, Hotel San Fran, San Francisco, Calif.

Sept. 14-15—Meeting all Abreast, Ashland, Ore., Oregon.

Sept. 15-17—1957 Canada Fairs and Flying Days, Royal Canadian Air Force, Weyburn, Saskatchewan.

Sept. 19-20—Reunions, American Gas Turbine Society & Turbine Award, P.D.A. Service, Engine Operation and Maintenance Forum, Midway Airport, Milwaukee, Wis., Sept. 19, 20th Annual Meeting of Engineers, Am. Inst. of Mining and Metallurgical Engineers, Milwaukee, Wis.

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AVIATION CALENDAR

(Continued from page F)
play, Ridgeport Municipal Airport, American Helicopters Society, New England Region, Ridgeport Municipal Airport, Conn. Read date in Sept. 73.

Sept. 27—*10th Annual Meeting*, American Society of Standardized Experiments, Statler Hotel, Buffalo, N.Y.

Sept. 28—*Post & Whitney Aircraft Engine Maintenance and Operation Forum*, presented by Southwest Aerospace Co., Tulsa, Okla.

Sept. 29—*1961 Fall Meeting*, Michigan Association Contractors, jointly sponsored by University of Michigan Transportation Institute, Western Michigan University, and the Michigan Auto Parts Manufacturers Association.

Sept. 30—*25th Annual Control Systems Conference*, Civil Air Patrol, Texas Room, Hotel Kansas City, Kans.

Sept. 30-Oct. 1—*National Aerospace Meeting*, Aerospace Industries Association, Hotel Washington, Dulles, Va., featuring "Design Seminar on Advanced Electronic Hand Ambassadors for Low-Earth Orbit."

Oct. 4—*4th Technical Session*, Meeting and Convocation, Southern Illinois University, Carbondale, Ill., Hotel Illinois.

Oct. 5—*First Annual Award Banquet*, Society of Experimental Test Pilots, Beverly Hills Hotel, Los Angeles.

Oct. 7-9—*19th Annual National Electronics Show*, McCormick Place, Chicago.

New VAN TRAILER by Craig
houses all this equipment . . . with room to spare!

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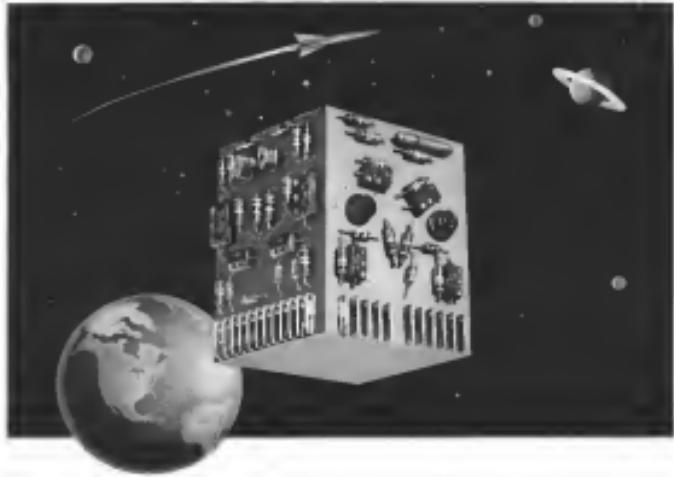
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with **enclosure** **Replies**.



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第四十屆研討會：論文

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Each hangar is specifically designed for the snow and roof loads of the area in which it is erected. The space at the rear is conveniently used for workshops, parts and offices.

Night view of TEMCO AIRCRAFT CORP. hangar at Greenville, Texas. The clear open area measures 120 feet deep by 370 feet long by 20 feet high. Vertical clearance at 45 feet inside the tall hangar.



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*Most revolutionary development
in the last fifty years*

Cantilever type construction means that no columns of any nature interrupt the clear span space. EVERY square foot of hangar space is a square foot of usable space. The support member which connects the top ridge of the cantilever to the top of the inner column is designed to act either in tension or compression and will withstand the exact load forces of any locality.



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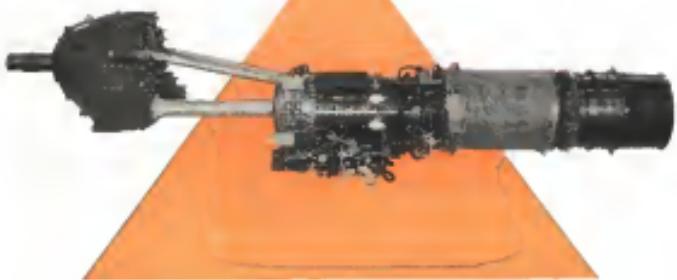
Mr. C. F. Zimmerman, Dept. Aviation Operations, CONTINENTAL OIL CO., remarked, "It is our opinion that this hangar constructed by your firm has measured up to our expectations and fulfills all of our requirements."

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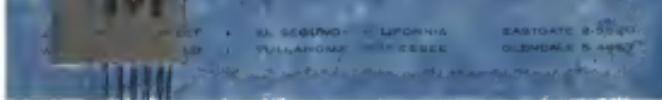
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the bird
that walks
on its
tail!



...with control components by **WESTERN GEAR**

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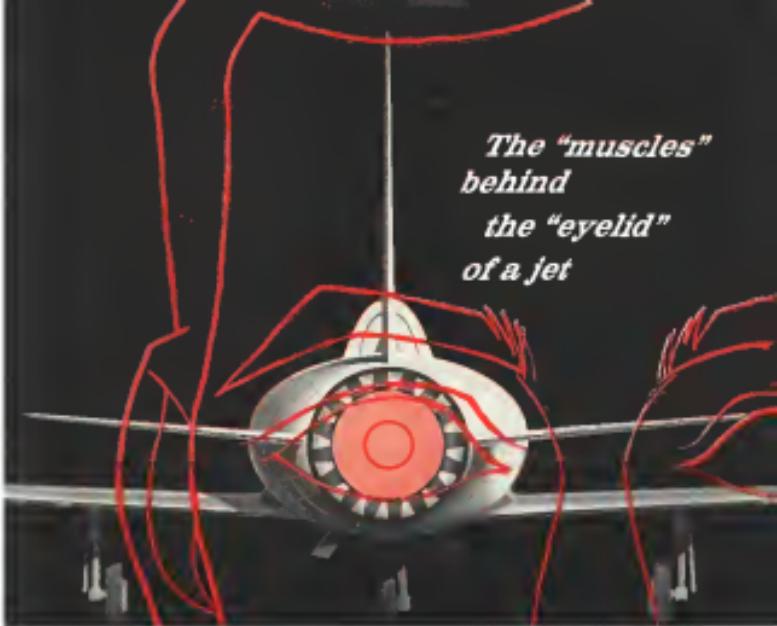


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*The "muscles"
behind
the "eyelid"
of a jet*



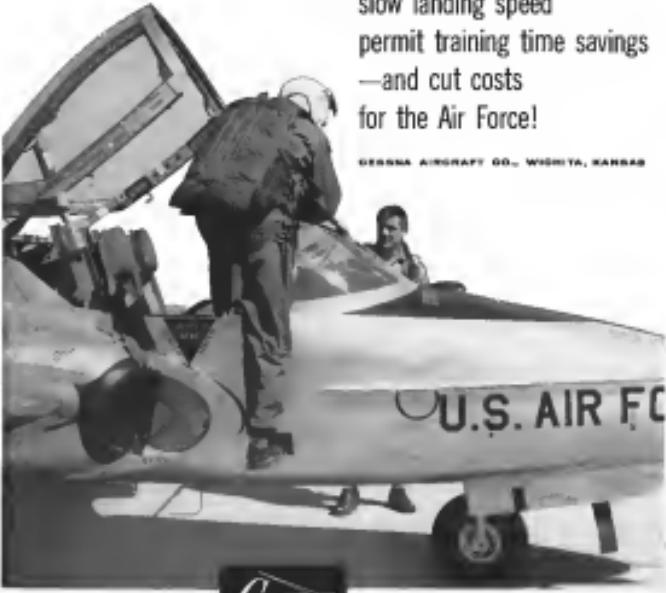
Jet aircraft using the "eyelid" type of variable area exhaust nozzles need actuators—or "muscles"—that respond instantly in temperatures ranging from minus 67 to plus 600 degrees. Ex-Cell-O builds such actuators . . . along with nozzles, blades, rotors, fuel controls, precision parts and assemblies.

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MISSILES AND AIRCRAFT FLY HIGHER, FASTER AND SAFER WITH PARTS AND ASSEMBLIES BY EX-CELL-O.

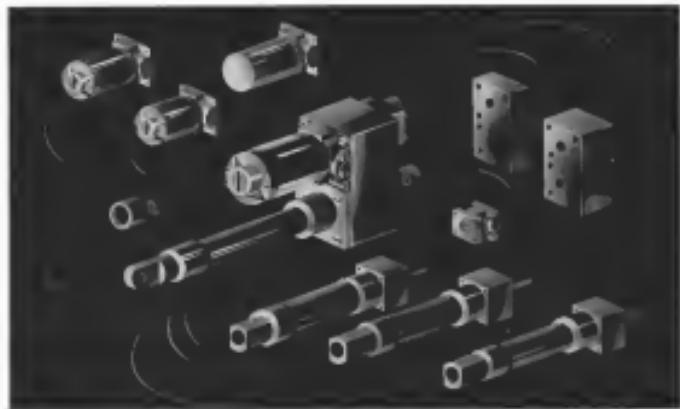


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in Cadet training,
the Cessna T-37
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easy maneuverability,
slow landing speed
permit training time savings
—and cut costs
for the Air Force!

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NOW...

AN EASIER STEP INTO FIRST-LINE JETS



Detailed illustration of Airborne's new modular control system. Each actuator can be assembled from various, standardized base actuator components. Components actually available appear in the diagram below.

New Airborne modular actuators give you greater design freedom, help eliminate specials

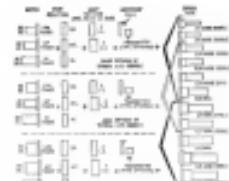
Airborne's new modular concept of linear actuator design is based on a system of standardized components. These components—motors, switches, gears—can be grouped in three broad operating capacity classifications: L12—up to 500 lb., L16—up to 2100 lb., and L20—up to 3500 lb. All components within each classification are interchangeable.

As a result, you see no longer limited to a list of, say, a dozen standard actuators whose design is relatively fixed. Instead, you can now select any one of several hundred possible combinations from over 40 standard Airborne actuator compo-

nents. In most of cases, that will give you a linear actuator meeting your capacity and configuration requirements exactly. Thus you have greater design freedom without becoming involved in the extra costs and delays associated with specials.

In addition, while cataloging under the modular system, we have refined the basic and increased the capacity of many Airborne actuator components. You get more power in a smaller package, saving valuable weight and precious space.

Write today for further information on Airborne's new modular actuator line.



Below: The extensive line of Airborne modular actuator components.

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CATALOG 57A

Diagram illustrates an airplane receiving its landing gear from the new Airborne actuator system. The landing gear is fully extended and held in that position by the actuator.



H. T. Brooks is a Convair Electronics Division Chief Design Engineer, responsible for Propulsion and Mechanics Design. A graduate of the University of Minnesota, Among His Many Projects at CONVAIR—~~now AVCO~~, he was Assistant Project Engineer on the Revolutionary delta-wing aircraft.

"Engineers—here's the story of the 'G-Limiter' development."

The specifications for Convair's F-102A required that this supersonic delta-wing interceptor fly itself during part of a tactical mission.

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The job of the Holley Power Control for jet aircraft is to sensitively control engine power according to the pilot's requirements and, at the same time, make automatic adjustments for split-second variations in altitude, pressure and temperature. The "brain center" of advanced Holley controls is a three dimensional cam which is so designed that it can adapt itself to all combinations of atmospheric temperature and pressure, from Thule to the

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The three dimensional cam, like the power control itself, is designed, engineered and manufactured by Holley—one of the world's foremost power control manufacturers.



Typical "brain center" of a Holley aircraft engine control. Note the delicate machined surfaces. Each plays a vital role in mechanically regulating the engine under varying conditions.

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Montrose Division manufactures a complete line of synchroscopic indicators and transmitters, servoed indicating systems, waveform scopes, heavy-duty control switches for pressure applications, and dynamometers. Montrose Division, Bendix Aviation Corporation, South Meriden, Conn.



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SOUTH MERIDEN, CONN.



September 2, 1957

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EDITORIAL

Facts and Fiction on the ICBM

Soviet announcement of successful test firing of an intercontinental ballistic missile produced more interest around the world than the missile made in its impact area. The Soviet announcement goes into the public record a fact that has been well known at the Pentagon and White House for at least nine months. First public news that the Soviets had begun experimental test firings of an intercontinental type ballistic missile was printed in *Aeronautics Weekly* May 20 (p. 26). For the past five months, top-level Pentagon and White House officials have been deeply concerned with how to cushion the effects on the American people and world opinion of the inevitable Soviet announcement of that fact.

The timing of the Soviet announcement indicates clearly how powerful the relative achievements of the U.S. and the USSR in the current technological environment are likely as a support of foreign policy. We would not know after the Sino-nato (AW Dec. 3, p. 21) that the era of ballistic missiles had arrived and henceforth the long range ballistic missile, whether atomic or nuclear in nature or not, would add significant weight to the international balance of power. The Soviets first used their intermediate range ballistic missile capability as a diplomatic threat against England and France in the Sino-crisis. Once again the Soviets have waited for a propitious moment in international diplomatic negotiations to turn their ICBM card face up on the international conference poker table. The Soviet announcement timed the announced ICBM firing as "a few days" before the official release. That may well be true. The first experimental firing began last winter, and there have been a number of test firings since in the regular intervals that distinguish experimental testing from the instant firing of samples from a missile production line. It is possible that the most recent Soviet ICBM firing was the first reasonably measurable missile in the experimental program and was considered the first sufficiently solid technical performance to warrant a public boast.

At any rate, the Soviets played their announcement to get maximum diplomatic value in the current environment confidence and to look as increasingly tough policy as a as the U.S. It will take some time before it becomes clear exactly how both the Soviet announcement and the official U.S. counter statements by Secretary of State John Foster Dulles and Deputy Secretary of Defense Donald Quarles are evaluated by our allies and the neutrals.

Many Americans will wonder how a technically undeveloped country such as the Soviet Union can even be in a position to seriously challenge the U.S. in such a technologically sophisticated field as ballistic missiles. The fault lies not with the quality or industry of U.S. technology but rather with the lack of imagination, courage and candor in our political leaders. Muscle men the world over (except perhaps in Stalinist versions of Russian technical history) acknowledge an American, Dr. Robert Goddard, as the pioneer of modern rocketry, but he received no official support and little private funding to continue his important work. The

German picked up Goddard's basic technology and went on to develop the V-2, first modern ballistic missile.

With the fall of Germany in 1945, both the U.S. and USSR had access to the substantial accumulation of ballistic missile technology developed by the Peenemuende project. Both countries in effect started from scratch in the ballistic missile business in 1946.

We may be the ward of a Soviet Air Force Colonel, G. A. Tokarev, an anti-Stalin defector who was in charge of organizing the aircraft and missile brains of Germany to work for Russia, that ballistic missile development was given top priority from the very start of the Soviet's post-war armament program. It was not until some time after the end of World War II that Soviet development of the German V-2 began competing as Sweden after two years over the Baltic Sea.

This country too began an extensive development program based on the German V-2 and also independent approaches by Convair, the Martin Co. and North American Aviation Inc., that produced significant new knowledge.

In the military command wire of 1949 ordered by President Truman and executed by the then Defense Secretary, Louis Johnson, the ballistic missile development program virtually evaporated along with the 70 group Air Force program.

For the next ten years—1949 to 1959—the pace of ballistic missile development in this country slowed to a leisure walk. During this same period the Soviets continued their top priority on ballistic missile development. It was the old story of the sonaros and the bats. While the U.S. had to task a forced nap through an "economy budget" sleeping pill the Soviet batmen prodded on at a steady if not spectacular pace.

There is no range on either side of the Iron Curtain in ballistic missile programs. It is slow learning to trill and crier, and the rate of progress is determined more by the true and scope of resources allotted than by any ballistic technological breakthrough. When in 1954 the U.S. suddenly became excited about the ICBM because of the feasibility of hydrogen warheads, money and manpower were poured into the program with a crescendo. Instead of concentrating on two or at the most three, different programs, Defense Department doctored both money and the limited technical resources then available so as less than the ballistic missile programs, including those in the strategically insignificant area of intermediate ranges. Thus, our history of ballistic missile development has ranged from a pinpricking start through head scratching to a goliath of funds that cannot be assimilated by our limited technical resources to ringing the insipid, lost years dominated by the "cover crop" state. Against this background, the Soviet bats must have passed quickly onward, not easily dented by failure, getting all the foreign technical assistance they could and backed by top priority from their political leaders.

That is why today we are running neck and neck with the Soviets in the ballistic missile race—a race that we would have won hands down if our political leaders had supported our technological capabilities. —Robert Hitz



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- 4. Aircraft Frame - Aluminum - 203 lbs - 84 inches.
- 5. Aircraft Landing Gear - Aluminum - 234 lbs - 57 inches.
- 6. Aircraft Tail Fin - Aluminum - 34 lbs - 19 inches.
- 7. Aircraft Link Frame - Aluminum - 416 lbs - 142 inches.
- 8. Aircraft Axle - Aluminum - 2 lbs - 30 inches.

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Pierre G. Desmols, vice president passenger service, Trans World Airlines, Inc. Mr. Desmols succeeds John H. Clemons, now executive assistant to the president's office.

Leonard Prusak, a vice president, Avianair, Inc., Linden, N.J.

Robert Cole, responsible director marketing and distribution, International products division, Metalco Asia Corp., Hongkong, N.Y.

Honors and Elections

The American Society of Mechanical Engineers has announced that Dr. Charles Stark Draper, Head of the Instrument Engineering Department and Director of the Instrumentation Laboratory of the Massachusetts Institute of Technology, has been awarded the Melvin Medal which is awarded annually to a "giant and unique set of engineering power." Dr. Draper also receives a new principle for controlling gun fire from moving platforms at mounting levels.

Capt. R. L. Wagner, retiring from United Airlines after 30 years of flying, won the first recipient of Flight Safety Foundation's annual safety recognition—"Patron" award.

The award will be presented to other pilots from time to time, with five entries annually reported and recorded in Flight Safety Foundation.

Changes

Charles A. Bois, engineering manager, Electronics Division, Rheem Manufacturing Co., Santa Clara, Calif.

Elmer E. Roden, general manager, Vela Assembly, El Segundo, Calif.

Eric B. Mon, director of engineering, Canadian Applied Research Ltd., Toronto, Canada.

The Engineering Department, General裁 and Technical Division, Pitney Bowes, Philadelphia, Pa., announced the following appointments: James B. Willson, director design system engineering; Herman A. Abid, director research and control engineering; John Colakowski, chief mechanical engineer.

(Continued on p. 108)

INDUSTRY OBSERVER

►McDonnell Aircraft Corp. is building two prototypes of a turboshaft helicopter for troop transport missions. Powered by two engines, first prototype is scheduled to fly in about Oct. 1. USAF provided the engines for the prototypes, with McDonnell bearing other costs.

►The Havilland Gyrojet engine with afterburner (AW Aug. 26, p. 62) has been run at more than 22,000 lb thrust. Highest figure previously announced for the engine is 23,000 lb.

►New monolithic casting technique for infrared mirrors developed by General Electric gives much more compact, single optical element, enabling this to be accomplished by conventional methods. Reliability reportedly adds only five pounds in weight. Application of monolithic casting to proposed infrared guidance weapon indicates (AW Aug. 12, p. 77) could greatly increase its utility by giving pilot an indication of intruder distance as well as bearing.

►Skyhook S-61 is a commercial version of the company's gas turbine powered development of the S-58 helicopter now flying in an experimental version. S-61 would be powered by two General Electric T58 turbines mounted on top of the fuselage with the pilot's seat moved down to the intermediate cabin level. Passenger capacity would be about 16 people.

►Full scale component tests using twisted wire wound turbine blades will be run by Wright Aeromechanics Division of Pratt & Whitney Corp. In these engine development, coated blades will be checked by regression of UHMWPE in jet streams between 2,500 and 2,800°. Blade root attachment also will be studied.

►Nothing will reduce afterburner model of General Electric's J75 turbojet for its T-45 experience trainer. North American will get a model of the engine without afterburner for its Sabreliner jet utility transport. First delivery of the J75 will be made next summer.

►First Panavia corporate model is scheduled to be fired by the British Army on new Scottish missile test range in the Shetland Islands in 1975. British Army will get the U.S. developed and produced Corporal short range surface-to-surface missile for its first operational guided missile trials.

►Bell Aerospace Corp. has developed a new horizon presentation for helicopter instrument panels which it will present to the Army sometime this fall for evaluation as part of an improved panel layout designed by Bell using available equipment. New technology uses a five axis cathode ray tube to give a more sensitive indication of change in attitude than is available from aircraft type horizon displays.

►Blackburn N.A. 10 supersonic maritime hauler under construction for the Royal Navy will be powered by two de Havilland Gyro Junior engines.

►Current afterburning, double-pulsedetonate nozzle use concept employing surface propagation. Army feasibility study is considering that device for sustained movement of aircraft in response to threat. One idea would provide a lightweight shielded power package.

►Studies are under way at Lockheed Aircraft Corp. on the feasibility of manufacturing 10,000 passenger seats configuration fitted with Allison 503-DH3 turbofan engines which will power the aircraft's Electra transport.

►All but one of 31 HASP (High Altitude Standing Platform) models failed in nose landing gear tests at Wallops Island, Va., range with successful. Based on Army Loka model, HASP is fired from ethylene propyl gas, sells temperature and humidity data at altitudes above 20,000 ft. (AW April 21, p. 31). Prototype equipped HASPs are to be tested in October. Weather instruments are to be evaluated next spring. Altitudes above 100,000 ft. already have been reached.



HOW THE SILICONES MAN HELPED...

Build a Gyro for Straight Shooting!

Accuracy that could hit a fly from a screaming roller coaster... so rugged that it can be used to drive a nail without singeing the operator. That's the "impossible" the control gyro built by Minnesota-Houswell, Acrostics Division, known as the ERG-5 (Electro-Integrating Gyro), lightweight and small enough to hold in the palm of your hand, it supplies the "sense of balance" necessary at supersonic speeds.

Operating in a vicious fluid-wide field of temperature and pressure, seals can be less than perfect. What material was used? "O" rings of UNION CARBIDE Silicones Rubber.

Patented by MURKIN Products Company, Racine, Wisconsin, these "O" rings were tested from -65 to +200 deg. F., at simulated pressures from ground level to operational altitudes. The new "Union Carbide" is a trademark of UCC.

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Grants-Lindquist, Service & General



SILICONES

Washington Roundup

Airlift Pressure

Despite Defense Department's seemingly budget watch for increasing payoffs from the armed forces, particularly the Army, for improved strategic airlift capabilities, the Marine Corps' budgetary committee (line 209) there are no plans at this point, particularly with load classifications, to expand strategic capacity. The arguments are both technical and cost. The services, State Army spokesman say, believe that to cut load short which would be adopted than that are now used over the debt in action as an option. Soldiers have no interest in one capability to fight a limited or Korean type war adds no options to the demand for strategic airlift. Army is incorporating into new procurement decisions for fast aircraft in heavily-weather areas, but top officials fear this could not get sufficient weight to raise a streamlined division to the front with its fighting tools.

D. C. Airport

Prospect for a new airport to handle some of Wash. area's non-airline air traffic recognition is still uncertain. Congress has appropriated \$12.5 million for the project, but with this stipulation—that the funds shall be used for construction and development—and the President shall make a report to the Congress with a recommendation as to the site. "The recommendation is due Jan. 15. The President and the Department of Commerce after studies and studies over the past decade have come to an recommended location at Burke, Va. The regulation means that should Burke again be recommended, as many staff opponents of this location will have another opportunity to kill off the project, in that have been successful or done so far."

Meanwhile, those who want to determine a location will be directed to Lt. Gen. Richard P. Gessner, presidential assistant for aviation planning.

Deep Freeze

First aircraft headed for Antarctic Operations Deep Freeze III, this year's scientific mission in the bottom of the world, will take off this week. Total of 44 planes will take part. Eight are Douglas C-134 Globemaster from 43d Air Force. Twenty-three are Navy aircraft ranging from the Lockheed P-3V to the de Havilland Otter, all attached to Air Development Squadron Six at Quonset Pt., R. I. There will be 15 Navy helicopters for this winter's operation.

Enlistment Stretch

Following USAF's lead (AW Aug. 26, p. 251) Navy will require heavier enrollment of civilian training candidates beginning Jan. 1. Recruits will result from three and a half years of active duty after training instead of the present two years. Training costs more than \$100,000 for each pilot. Except from the new regulations—Nevada (see AW August 26).

Alaska Certification

Presiding Enlistedman last week signed a bill authorizing permanent commissioning of U.S. Alaska soldiers but also "absolutely" as grants. Thus the number of U.S. Alaska troops comes "a tomorrow." The President held the bill on his desk until the last possible instant before

deciding to sign it to give evidence in either reason that vigorous opposition to the legislation by Commerce Secretary Stetson Weller could lead to a veto. Weller, like other personnel, was sympathetic to Pacific Northwest Airlines. Alaska Airlines and a small segment of Northwest Airlines President Egan said he was hoping that Alaska Airlines might effect a merger. But once no merger has taken place, he added, regardless of the two airlines have "more in about \$5,000,000." At the present time, that change is over \$3,000,000.

Guaranteed Loan

Legislation providing for government guarantee of private loans to local service centers managed to pass in Congress after having shaken off two proposed amendments that would have restricted the scope of the bill. Originally, the Senate bill excluded independent service centers from the loan program. The Civil Aviation Board would think the segment of the industry "was closed," the measure was passed to include the helicopter firms. Another amendment that originated in the Senate would have limited loans to cover only aircraft manufactured under a U.S. type certificate issued after the enactment of the law. Originally, Senate Bill Monogram (SD-101) pointed out that this would have the effect of restricting loans to aircraft manufacturers. Pending step, the proposed Douglas 7480 (AW March 25, p. 121) and the Douglas 7481. He added that since at least one carrier expected to commence operations immediately by the use of Monogram planes, the legislation was written to provide loans for any aircraft which, in the view of the CAB, would actually improve the service.

Claims Against Rails

Supplemental railroads are increasing their claim against railroads for violating eminent laws in holding on each rail line to a total of \$14,445 million. Five lines already have won damages of \$45 million from the U.S. District Court for the District of Columbia. Twenty-six additional lines have now joined in the case pending before the U.S. Court of Appeals for damages of \$99.6 million more. Meanwhile, Congress passed legislation in the administration's bill explicitly authorizing the railroads to sue in federal court for damages on railroads' behalf. In effect, the court case will probably be the sole just of prolonged legal arguments. Congress, however, stipulated that the legislation was to have no effect.

Color Barrier Crack

Important crack in railroad color barrier was made by appointment of James O. Powers, a Negro, as Trans World Airlines executive assigned to the director of personnel and industrial relations. Appointment is first of Negro to an airline policy-making executive job.

Patton Factors Air Force base and regional manager is a graduate of Loyola University with engineering and management experience. TWA has made an change of racial discrimination in becoming down with color. Eight vice presidents (AW July 5, p. 41) down grade came from Vice President Robert Nixon and the Urban League of New York, among others. In fact, the Negro race members hasn't shied off can be expected to resent.

—Washington Staff

USAF Spells Out Procurement Policies

Soviet firing won't affect ICBM program, Douglas tells West Coast industry; Irvine stresses cuts.

By Richard Sweeney

Los Angeles—Russia's announcement of successful firing of an ICBM should not be a cause for concern, says a defense spokesman supporting the announcement shown so, Air Force Secretary James Douglas does not feel it will cause USAF to make any change in its ballistic missile program.

Douglas and Lt. Gen. C. S. Irvine, USAF deputy chief of staff, research, were formally appointed at a large meeting of Southern California aircraft industry leaders sponsored last week by Los Angeles Chamber of Commerce and Los Angeles Air Procurement Board, at which USAF future procurement plans at their effect on arms were outlined.

Military Philosophy

The secretary went on to point out that:

• Ballistic missiles are only one method of delivering a warhead, and for some time yet they will not approach the reliability of a manned aircraft in striking designated targets.

• USAF, which presently leads the world in aircraft development, with B-47 and KC-97, the B-52 and upcoming BQ-135 contributions, finds development of a long range, supersonic cruise missile, WS-116A, is a high priority project.

Douglas said he could not give the date for a decision on the aerial map of the WS-116A program.

• Fifteen bombers, such as Shrike, also figure in long range delivery systems.

• Long range strategic air systems are aligned with the B-52 and WS-116A as key long range delivery systems.

• USAF will go ahead with Atlas and Titan, and other long range delivery systems such as bombers plus aerospace missiles and will continue some development down the road before decisions on these latter are made.

In addition, Douglas said, in the tactical field USAF must provide advanced fighter bombers, tactical missiles and strategic strike. New strike capability is now under test but, as far as the C-132 was concerned, and no production started on C-133A until after the year's budget although cutting financial contracts will cover project shortly would not bring very soon.

Concerning Southern California specifically, Douglas indicated there will be no major cutbacks in the area this

year. Stratforths for Lockheed F-104 and Convair F-106 have continued programs over year and have had a steady rate of growth, Douglas said.

The secretary told the meeting that the 25 to 30% of USAF power and subcontract work which is done in the metropolitan Los Angeles area will continue that level year. He also disclosed that dispersal is a dual issue for the area's concentrated aerospace industry.

Industry Commended

Douglas commended industry for "large savings that have been produced and achieved, and in some areas, without any effect upon production schedules."

For its part, USAF will reduce its surplus personnel by 25,000 by Dec. 31, to bring USAF strength down to 900,000. In civilian personnel, 5% or 30,000 will be tapped from panels by Oct. 31.

Irvine told the membership of 1,300 industry representatives that USAF saw fit it necessary to follow certain safeguards, chiefly one in which reac-

USAF commanders and members of the air staff work out a system of mission priorities and mission solutions for future requirements, and development and production programs are integrated by the two.

While the practice is not new, Irvine continued, it now gets added emphasis, another in "a more rapid rate of all development projects, reducing only those which show distinct promise for significant operational advantages."

Small improvements or low priority projects will have to fall by the wayside.

Concerning the specific report of dual availability of mission solutions and the present and upcoming aircraft selection device:

- Many weapon companies and their subcontractors will experience slowdowns, standstills or downright cancellation of programs as a result of mission priorities and selection decisions, not because it is a certain company's project or located in a specific area.

- Sharp reduction in requirement for high risk facilities will lead to smaller production runs and thus increased large aircraft development costs to eliminate the element of greater flexibility which are unusable for production manufacturing, maintenance and storage purposes, although new facilities the double programs require for test and assembly will have to be built in isolated locations.

- Fourty dollars, this fiscal year about 50% of the cost in the last six months of last year will be spent on relatively fewer programs and fewer end items. To be really competitive for these defense contracts, which will take into account management and engineering processes and production techniques with a more toward cutting "front of fact" costs, reduces excess engineering and manufacturing space and personnel, unnecessary purchases and overruns and plant operating expenses. "We want more self-sufficient hardware and less overhead," he said.

Panel Limits

Since USAF must stay within present fixed funds, Irvine said, and in preparing up-coming budgets, "we must know which item and location expenditures right down to the plant, to be treated as non-discretionary, to be treated as a priority, to be treated as a non-priority, and what we are going to do with the rest."

Also, he said, "we must know what there will be in USAF procurement, in maintenance, modification and overhaul at Air Force depots or by contractors, for others than first line aircraft. USAF intends to do normal base maintenance on older types of aircraft and then, with the exception of being non-flammable without major overhaul at which time they will be revised."

USAF Ballistic Missile Who's Who

Principal responsibilities in Air Force ballistic missile programs, and their roles, are listed below:

- **Air Force:** General
- **New York:** General Electric
- **Poughkeepsie:** North American
- **Glendale:** General Electric (ground based solid and relic control) and Boeing (range interpretation facility)

Title

- **Assistant: Martin**
- **New York:** Area
- **Poughkeepsie:** Area General
- **Glendale:** Assistant Base Area (initial) Bell Telephone Laboratories (ground-based solid) and Sperry Rand (range solid)

Title

- **Assistant: Douglas**
- **New York:** General Electric
- **Poughkeepsie:** North American
- **Glendale:** A.C. Spark Plug (initial), Bell Telephone Laboratories (ground-based solid)

versus planned dollar levels."

The target advanced procurement techniques and cost reduction and tape control of machining are examples of electronic data processing and audit random testing methods which will peak at 100 pounds of hardware per kilowatt hour and assist products design for engineering best.

Concerning subcontractors, Irvine said USAF will continue to require prime and secondary contractors to subcontract a substantial portion of their workload to specialized firms and small businesses. USAF wants to make sure subcontracting is done so as to minimize basic hours to be worked.

He is quoted as saying:

- "While we will probably want general contractors to represent us before the most concerned source of action."
- USAF does not want a prime or associate contractor to recall subcontractors if to fall up to what we could buy elsewhere just to compensate for reductions caused by subcontractors in our cell phone."

- USAF does not intend to hand it back to small business unless a dollar gets a dollar's worth of hardware. There will be no subcontracting the stringent, high cost, low dollar projects.

- In the procurement of military aircraft, we are going to be much more involved in USAF procurement, in maintenance, modification and overhaul at Air Force depots or by contractors, for others than first line aircraft. USAF intends to do normal base maintenance on older types of aircraft and then, with the exception of being non-flammable without major overhaul at which time they will be revised."

Russia Confirms ICBM Firing; Congress Debates U.S. Progress

Washington—Soviet Union officials announced last week it has successfully fired a multi-stage intercontinental ballistic missile over a long distance and the rocket landed in the target area. Assistant Army Secy. of Defense John T. McCallum, who witnessed the test reported the next day that test of a Russian ICBM occurred at Patrick ABM last June 11. The missile was destroyed after a 22-hour flight because of an engine guidance unit failure.

McCallum, in front of the House Armed Services Committee, said the test of the first of two Peacekeeper ICBMs occurred at Patrick ABM last June 11. The missile was destroyed after a 22-hour flight because of an engine guidance unit failure.

McCallum said the second Peacekeeper ICBM was launched at Vandenberg AFB on June 17, 1967, 16 JUN 1967.

Now Atlas ICBM test is scheduled for October. Convair Division of General Dynamics Corp has produced more than a dozen Atlas for test purposes. USAF plans to fly 40 operational Atlas at the minimum. In 1959 and 1960 operational Titan ICBMs by 1961.

Titan, with Altina Co. as prime contractor, cost \$9.5 billion at least a year away from start and long range development.

Truth of the Russian announcement officially went unpublicized in official documents. First official reaction came from Congressional committee costs not from Department of Defense but from Secretary of State John Foster Dulles at a press conference. This was followed 24 hours after the Russian announcement in a press release quoting Deputy Secretary of Defense Robert A. Quesada. His statement had been cleared to State Department and the White House.

Dulles and the U.S. has "no independent basis of confirmation" of the Soviet statement but said "the basic principles of our policy are unchanged." Although the two sides were very much alike, Dulles' words were very much alike and could cover much or could

cover little. In general, the Soviet statements in this area have had some supporting fact.

Quesada said the announcement "was not surprising," and that "we have for some time suspected the Soviets had substantial progress in the long range ballistic missile field and have made clear that our own work, in this same field, is being pressed forward in a broad front and with a high priority."

Both Dulles and Quesada pointed out the obvious propagandistic value of the timing of the announcement, with the assessment talks under way in London as internal crisis in Syria and a meeting of the United Nations upcoming.

"These differences in terms of operation methods will probably not be very great one way or the other," Quesada stressed and "and the immediate outcome significance of the acquisition between Russia and the U.S. has hardly begun," he concluded.

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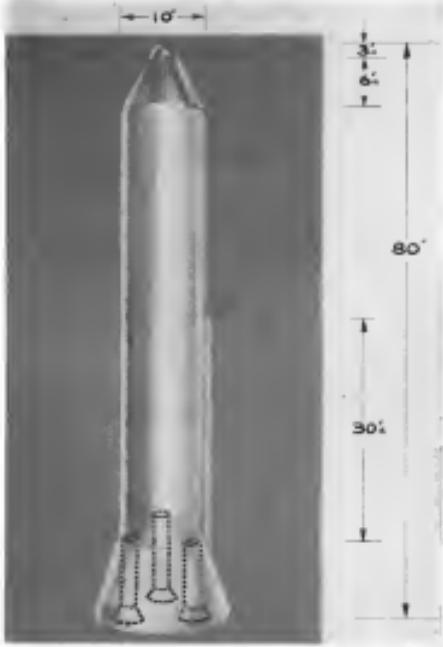
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ICBM Debate

Washington—Senate Appropriations Committee and in its report on Defense Department's fiscal 1968 budget in May that "we are in doubt about the Soviets in the field of guided missiles generally."

"So the ballistic missile field we are probably behind the Soviets in the production of the intermediate range missiles, and we are probably ahead of the Soviets in the field of strategic missiles," he said. In the fiscal 1968 budget, Sen. George Whittington pointed out we are no doubt ahead of the Soviets in the important field of operational bases but it must be admitted that the Soviets are making important progress in this area. "This is no reason for complacency among our people in the consideration of our defense program."

Gen. Gordon House USAF Assistant Secretary for Research and Development, told the Senate Armed Services Committee last year that he believed Russia was ahead of the U.S. in development of the IRBM and might as might not come up short on the ICBM, since they had taken a "step by step" or "methodical German approach" and "we decided to go for the ICBM in one group."



AVIATION WEEK artist's sketch of the Gavir Afar KCRM shows future missile in three rms that from public property went off less than 100 ft. The missile's external guidance package, segmented blunt nose cone, two stage propellant system.

and at jet had a successful flight.

See Henry M. Jackson (D-Wash.) cited the "general collapse of defense programs" and said even the ballistic missile program—despite its priorities—was being spared. He called for full-speed development of HRBMs and KCBMs and an increase in the production rate of the Boeing B-52 intercontinental bombers.

But after congressional leaders had dinner, it was the problem.

"While it is true that the Defense Department is not spending money as fast as it originally contemplated on our ICBM program, it is also true that there has been no holdback," Rep. George Miller (D-Calif.), chairman of the House Armed Services Appropriations Subcommittee said.

There has been no cutback in the program that would be demonstrable. We are moving forward as fast as is reasonable."

Rep. John Tiberi (R-N.Y.), ranking minority member of House Appropriations Committee, said, "It is not true that concern—either on the part of Congress or the administration—has affected our efforts."

"The slowdown," Rep. Tiberi said, "has been in areas where we are piling up staff for standard work which will be delayed and which will be done slowly. There is not a lot of truth in any allegation that there has been a slowdown in the KCRM program. There has been no economy in the things that count."

Sen. Stuart Symington (D-Mo.) also charged economy is burgeoning development. He said it is "almost impossible to realize that the administration has slowed down our effort [on KCBMs] for purely budgetary and fiscal reasons."

Sen. Levenett Schildknecht (R-Minn.), the administration's top Capitol Hill spokesman on defense matters, disagreed, saying no proposal of the defense program is necessary.

"Without pulling the top of the barrel and having an explosion in all directions, all expenditures or appropriations that could be reasonably substantiated for the KCRM or for research and development have been made," Sen. Schildknecht said. "Our military people have been moving forward so fast in this case and with the project to the point of final development by other nations as well as ourselves."

Russian statement of the missile being discussed recent test explosions of nuclear and thermonuclear weapons in the Soviet Union. Nothing in the statement, however, related nuclear or thermonuclear weapons directly to a warhead for rockets.

The "long-range-distance intercontinental missile" ballistic rocket was launched a few days ago," the Russian statement and "The tests... were successful. They fully confirmed the accuracy of the calculations and the reliability of the design."

"The most flew at a very high unparalleled altitude," the statement said. Covering a long distance is a key benefit the rocket needed in the target zone. The results obtained show that it is possible to direct warheads into any part of the world."

The solution of the problem of designing intercontinental ballistic rockets will make it possible to reach remote areas without resorting to a strategic air force. In addition, at the present time it is feasible to update means of nuclear craft delivery."

Av. Force has not been allowed to make any official statement about launching of its Afar KCRM or planned schedule for Tatars KCRM test flights. Even intercontinental range ballistic missile forces base Pafrauk AFB (gi) was prohibited to it for official comment at concerned.



WATER based air logistic system loads eight pt. Martin SeaMiners, twice the size of PBM, is depicted by artist.

Martin Proposes New Air Logistics Plan

By Event Clark

Washington—Eighteen SeaMiner aircraft, built of a water-based air logistics system and twice the size of the PBM flying boat, are proposed for use in the Persian Gulf.

Martin also opened a campaign in the public and congressional districts of short a call for a lack of adequate military aid and the "middleblock" in the way of reducing it.

Slow-loading SeaMiners would have approximately twice the SeaMiner's 151 ft length and 106 ft span; a speed of 300-600 ft per second; and a gross weight of 300,000 lb.

First generation would be powered by Pratt & Whitney T70 turboprop, mounted in ducted fan turbines and fired by nuclear reactors, all using the same airframe.

Funding Plan

Marts and development and procurement could be funded within present budget levels and funds now being spent for sea and land transport that SeaMiner could replace.

Production could begin within 24 months and cost of production models would be an estimated \$7 to \$7.5 million, roughly half that of PBM or B-52.

Draft of the SeaMiner SALS loaded would be \$1.5 billion. Extensive studies of water areas of the world which could handle the SeaMiner show an initial ability of 15 to 17 percent officials in

countries with whom the U.S. has defense commitments. These could be saved logically if only England, Japan and North Africa were included in SeaMiner from Martin before 1990.

Water-based air logistics system presented as a viable design comprising the heart of a complete system, including buying and when for fitting crews and crews of sea.

SeaMiner is capable of loading 10 ft waves or in 100 ft of snow and ocean concept includes plan for clearing air from water areas or incorporating down to -40°, Martin said.

Martin believes 100% of the personnel and 75% of the equipment now shipped by land could be moved by air logistics. SeaMiner runs environmental-tight pieces of military equipment on

aircraft—Aviation Week

Briefings on SeaMiner concept have been made over past six weeks to aviation trade associations and defense and congressional aides, including White House officials under further briefings are planned for August, defense and congressional critics and for defense computer and software

Headblocks

Citing recent congressional testimony on the lack of strategic strategic and defense and congressional aides, including White House officials under further briefings are planned for August, defense and congressional critics and for defense computer and software

• Chairman of Department of Defense and Congress from the momentous air force to be upped, that appears to coincide with actions. Miller pointed out that the SeaMiner would be "farmer taxes" for the nation to use but the best common for military requirements." He said it should not mean for designers with commercial possible not as much as a tank should be designed to double as a train. Miller believes 10 SeaMiners would have the same capability of the 900 military and civilian rescue transports now available.

While land-based aircraft should continue to serve some of the overseas and anti-submarine roles, aircraft

PBM Tanker

Edmonton—Prudhoe Bay SeaMiner probe and design refueling equipment will be built in Flight Refueling Inc., for Martin Co. and supplied as an early model for PBM. PBM will be able to transfer air reverse nearly 80,000 gal at the most economical speeds and distances. Flight Refueling and Submarines serve many sites, which now carry crews or crews pod interchangeably so will take refueling equipment as a removable mass door pit.

based aircraft can be used to serve coast air bases whose fields do not exist or are destroyed such as in war, and in areas where troops are needed to quickly move to new temporary locations.

• Defense Department. Although Army and Marine have great need for airlift and have shown interest in SeaMaster's con-

cept, Air Force has the budgetary responsibility to provide it. Navy has development, procurement and operational responsibility for seagoing.

• Purchaser of land-based planes must be compensated on other logistic costs, Mulcahy said. But water-based aircraft

would replace long transport aircraft which cannot survive on patrols under modern combat conditions—surface shipping for personnel and supplies would not be required, and could haul all cargo into the combat area. So, a tag of \$30 million could be absorbed in the Military Sea Transport System alone, Mulcahy said.

Lockheed Offers C-130B to Civil Lines



PAYLOAD of one Hercules flight included 21 truckloads of engine parts for shopping centers (above) along 2,100 lbs. of 100 ruger parts 100 lbs. of lumber charcut, 140 lbs. Load was lifted from Marietta, Ga. to Indianapolis, Ind.

Marietta, Ga.—Lockheed Aircraft Corp. announced today it will make its first bid to enter the rapidly growing air freight market with plans to offer a civilian version of the Hercules C-130 transport cargo plane to the airlines as an all-cargo, nonstop commercial freighter.

The air freighter, which will be the first nonstop plane to be produced at Lockheed's Georgia Division, will be introduced into the commercial market with an extensive sales campaign. Robert J. Stroessl has been appointed Herkules commercial sales manager.

Stroessl, former manager of sales engineering at the Georgia Division, will begin his campaign next week at the 11th annual conference of the International Air Transport Assn. in Madrid, Spain.

1960 Delivery

Operating and performance characteristics of the commercial cargo plane are the same as in the USAF C-130B (AW Aug. 12, p. 36) recently introduced as an improved version of the C-130A (AW Dec. 3, p. 50). The commercial version will be designated Lockheed's production model 135A.

Bid estimated cost of the aircraft is the low \$2 million category. Delivered to the customer by 1960. The plane will be powered by four Allison 501-D27 turboprop engines rated at 4,950 shp each.

Lockheed's division to introduce the C-130B as a commercial cargo plane is based on the increasing volume of air freight which the manufacturer says, doubled almost constantly during the last six months of 1957. Lockheed's commercial backlog, centered in the California Division, represented 29% of the company's total during the first half of 1958.

In an research published 10 years ago, Air Corp Inc., a corporation wholly owned by the scheduled airlines, said no less than 100,000 tons of the newest had increased from 15 million in 1947 to 141 million in 1956.

The import authorities the majority of freight moved is the scheduled airlines is currently handled on passenger aircraft but adds that scheduled air-

cargo services operated with military cargo aircraft are grossly limited in the handling of freight.

Most airline cargo officials feel there is a market for cargo aircraft much as the one being offered by Lockheed. They point to the trend toward the purchase of large aircraft by the airlines for exclusive cargo use instead of chartering in which they are estimated to be about C-130s.

Both American Airlines and United Airlines are operating DC-6s equipped with all-cargo schedules and Flying Tiger recently introduced a ship in cruise on grain services in its air fleet of 12 Lockheed 1049C Constellations (AW Aug. 26, p. 45).

Straight-in Landing

Lockheed claims the air freighter is the first U.S. commercial plane to incorporate "straight-in" track and roll-level landing facilities. The aircraft has a large rear slide 51 inches off the ground and is equipped with an integral tail landing strip 34 ft. long and 10 ft. wide. The strip can be lowered for direct cargo loading from the ground or can be used from doors. After landing the air freighter is 18 ft. wide and 8 ft. high.

A forward door, 6 ft. 7 in. wide by 6 ft. 6 in. high provides additional loading and off-loading facilities.

The plane will have a payload of 22 tons. For maximum distance of 1,799 statute miles under normal fuel reserve or a payload of 16 tons on ranges of 1,800 statute miles.

Cruising speed of the aircraft will be approximately 350 mph at altitude to 19,000 ft.

The aircraft can be quickly converted to skid-wheel operation for cold climates and has been designed in a "high performance" all-highlift configuration. It can be backed into position under its own power and can be turned in its tracks by means of a reversible tail near wheel.

Propeller Change

The plane will be equipped with 13 ft. dual-bladed propellers instead of the 15 ft. fixed-pitch propeller used on the C-130A. Fuel capacity is 6,900 gallons. Lockheed feels that the nosewheel and engine will have undergone considerable operating experience in the time the first commercial delivery is made. At present, flight hours accumulated on C-130A are approximately 15,000.

Several meetings have been held with the Civil Aviation Administration to discuss design features of the new plane. CAA has issued a preliminary statement concerning structural fatigue tests of the C-130A. According to a Lockheed spokesman, the manufacturer expects the tests to provide a good background for the certification proceedings for the 232A air freighter.



BACKUP of flight deck of commercial version of Hercules is demonstrated at Lockheed Aircraft Corp.'s Marietta, Ga. plant. Compartment contains two bunks, hot meal galley, storage space, toilet facilities, resuscitation and lavatories.

Hybrid IRBM Fight May Fall Into Management, Not Technical Fields

By Philip J. Klem

SEN. FREDERICK DUGGAN, senior aerospace spokesman on the Senate approach to managing development of an inter ballistic range ballistic missile, may prove a more serious barrier to evolving a hybrid IRBM than the technological differences between the Air Force's Jupiter and the USAF's Fleet system. Duggan has by far the most USAF officials available.

Secretary of Defense's recently formed aerospace IRBM committee, which meets each day to consider technical feasibility of a hybrid "Thorpan," consists of William H. Drabkin, Defense Secretary's special assistant on guided missiles; Maj. Gen. J. R. Melton, chief of Army Ballistic Missile Agency; and Maj. Gen. Bertrand A. Schreiber, chief of USAF's Ballistic Missiles Division.

Gen. Schreiber is in San Francisco to address the Western Electronics Conference, and there is no basic difference between the Jupiter and Thorpan IRBMs. The Thorpan is a hybrid of the Redstone ballistic missile, powered by solid rocket boosters and both have conventional solid motor guidance systems under development for possible battlefield purposes. Gen. Schreiber and Maj. Gen. Drabkin, in a speech at the conference, outlined the example cited Jupiter's success in achieving range. That uses liquid fueled propellant.

Secretary of the Army Walter M. Bruecker and Gen. Schreiber spoke at WEC on opposite days and neither made a direct reference to the Thorpan conflict. However, their speeches contained oblique references to the Thorpan's developmental problems, he believes, in the two sessions.

Jupiter, which Bruecker said is "slightly ahead of schedule," was cited as a splendid example of the advantages of the Army's philosophy of developing missiles in its own Redstone Arsenal, thus raising them over to industry to produce. "When we turn a project over to industry, most of the problems...are born out of the process," he has claimed.

"We have a good road map to assure acceptable performance. We know why certain leads must be met and to be...has been our policy," Bruecker said.

Thus, as a general reference to Air Force practice, Bruecker said: "There is a philosophy of procurement which advocates contracting out, usually, everything and putting upon contractors the whole job of determining

what should be supplied. This can lead to false starts, frequent modifications and unsatisfactory solutions. Such procedures are wasteful, costly and time-consuming."

Without mentioning Avery's successful flights of Jupiter test flights, Gen. Schreiber said he single or a few units of a missile built beforehand failure is an incentive to a clearly augmented model stage may be a satisfactory approach to shorten a principle.

Gen. Drabkin's task is to organize the agency program to attain the initial flying test of the Thorpan engineering models using them as soon as is reasonable, the attainment of which through a great deal of testing, and an industry capable to reproduce the results to the quantities required.

Therefore, we have field equipment in place planning that production and operational capability are the real end goals of the development."

Without giving release to publish any flight test data of Army engineering models, Gen. Schreiber and the USAF missile teams resemble an ironing on that only a small portion of the total problems.

"Hundreds of flights may be required to accumulate a large bank of operating experience," he said. "Attention and proof of reliability are not relevant to flight tests because of the enormous expense and relatively small amount of data obtained. Whoever possible all solutions must be brought to a high reliability by testing in the ground."

Gen. Schreiber's comments represent a hybrid IRBM some observers believe, in the spectrum of which service would be best suited to develop it. And whether it would be carried out in Redstone Arsenal as in industry under Gen. Schreiber and Ramo-Wooldridge. To these observers the problem of evolving a hybrid "Thorpan" appears to center on assessing the cost of evolving a hybrid IRBM development management organization and philosophy.

ICBM Defense

These orderly issues have complicated military spending. Thus ICBM test programs for positive defense against new or unusual threats remain and their reports are now available. One recent report, "Comprehensive Report on the Defense of America's Land-Based Forces," by Douglas Aircraft Co., Telephonics Laboratories (AW Aug. 13, p. 25)



Piloting of Bloodhound's low-burn-rate motor, two stages at once (top right). Wagon carries complete



British Bloodhound Displayed

Bristol Bloodhound ground-to-air surface-to-air missile is powered by two Thor engines with thrust estimated at 3,000 lb each. First solid fuel booster rockets are hung at bottom from a common ring (below, left) and an expansion nozzle part extends from downward attachment point and full length, with seeing ring intact (AVW Aug. 26, p. 28)



Piloting of Bloodhound's low-burn-rate motor, two stages at once (top right). Wagon carries complete

Heat Problems Limit Rocket Fuel Gains

Elevation. II—Heat problems likely to be formidable and of the hot, fast chemical propellants in rocket engines if they are not solved, and worse problems will carry over into one of "high-energy propellants and nuclear type boosters," USAF Brig Gen Marvin C. Deneker told an Aviation Research Society meeting here last week.

Gen Deneker, Air Research and Development Command's deputy comander for R&D, and magnetic fluid dynamics—a specialist of what is now "longing long" on the horizon in the realm of propulsion, II, said there were indications that losses might be so great that for the ultimate propulsion of a rocket¹

Gen Deneker said the work is going into fuel densities to determine the expertise of investigating basic physical phenomena and of improving calculations of such investigations.

Further gains in range speed and payload capability are possible through continued development of current rocket engine techniques, Gen Deneker said.

"But as long as we are dependent on increasing specific impulse, with its attendant problems of reheat, combustion chamber cooling and associated with mass burners, such as the weight of cooling fluids, the high factor of acceleration, the cost of exotic fuels, the need for further understanding of combustion processes and the basic principles by which a heat engine operates,"

Heat Barrier

Heat, he said, is "one of the foremost barriers" to further development of chemical fuel rocket engines. "To date systems which will survive the high temperatures and pressures of the first few seconds of flight have not been developed," he said, but he also said greater propulsion research effort and greater exchange of information between scientists and Air Force are needed.

"Follow in that attempt angles a forcible end of the line for chemical propellants."

Gen Deneker and the rocket master in whom particles released in combustion fly against walls of the combustion chamber is "a second barrier to optimum employment of chemical fuel."

Researchers found that small particles influenced in strong magnetic fields "could be directed and isolated" and that after being three magnetic forces to either fly particles move from the walls of the chamber, just creating heat loss to the walls of the chamber," Gen Deneker said.

Advancing into use of high-energy

Ionic Propulsion Research

Washington—At least five contracts for exploratory research into the possibility of ionic propulsion are being sponsored by Air Force Office of Scientific Research. None are being negotiated.

Sigulations of AFOSR programs is after three decades of theoretical studies, some propulsion now is the subject of active, sponsored research, with attempts being made under some of the contracts to achieve them on a laboratory scale.

Contractors include Avco Manufacturing Corp., Goddard Space Agency, Lockheed Research Division, North American Aviation Inc. (AVW April 5, p. 27), Grumman Inc., and linear accelerator studies at University of Utah and Ames Research Center on particle acceleration and high velocity impact.

Other organizations that have shown interest in ionic propulsion publications are Convair Division of General Dynamics Corp. (AVW May 4, p. 184) and Argonne Corp.

Estimates of rocket speeds attainable with ionic propulsion range as high as Mach 1,000 and estimates on specific impulse possible have ranged up to 300,000 sec, but these still is wide disagreement.

Ionic propulsion system would obtain thrust by electrostatically accelerating streams of charged particles (AVW Nov. 28, p. 87). Ionized helium need for a great electrical power source, but that thrust is low although achievable over a long period of time and used for conversion power for operation in earth's atmosphere.

Proposed later this year, the RPD corresponds in the research and ARDC Technical Program (Development) Planning Document in the areas of technical requirements and development of ionic. There will be one RPD document of the Air Force Research Program inter-propulsion, space, materials, electronic applications, biomaterials and aerosciences.

Atom Rocket Engines Studied by Lockheed

Seattle—Cold-Nuclear propellant for missiles is under serious investigation at Lockheed Defense Corp.'s Missile Systems Division.

In Los Angeles, Michael M. Rostoker, assistant general manager for research and development, said a three million-cv Vela de Cern positive ion accelerator will be used in investigation of the possibilities of nuclear propulsion. The accelerator, largest in use in the world, is now in operation but work at the Lockheed Nuclear Laboratories at Sandia, New Mexico's industrial park, will begin.

The accelerator produces nuclear radiation under controlled conditions generating great quantities of ionizing radiation. Bridges or balloon radars will be used to bombard targets. De R. D. Maffett will direct the work.

Plans to be investigated include nuclear structure, reactor design, with new shielding design and material strengths.

The accelerator will be made available to neighboring scientific organizations in a commercial basis. It is the

best of its type to be used on the Wind Tunnel. The 2,500 sq ft acceleration section is surrounded by three ft concrete walls. A large pit beneath the tunnel permits injection of methane from the floor. Control rooms at 500 sq ft. The laboratory also contains a radio-free-field work cell over the accelerometer room where natural or artificial radiation sources may be removed from contestants by remote control to expose materials for study purposes.

Aero Design Facility Destroyed by Fire

Bethel, Ohio.—Main production facilities of Aero Design and Engineering Corp. was destroyed by fire last week. Damage is estimated at \$1 million, including seven Aero Commanders which were on the production line when the plant burned.

Aero Design will shift production work to its new production complex now serving the market from the learned facility. Aero Design President B. T. Asay, Jr. said the company will continue doing business as usual and there will be no interruptions in customer support or the manufacture of space parts for Aero Commanders.

Production facilities will be established on an expedited basis in the new plant, and the company hopes to start rolling new Commanders out in 90 days. The new building is two floors. Ground floor will be occupied with office work, and the second Design for 16 aircraft in its production pipeline.

Senate Group Attacks USAF Procurement

Washington—Procurement of weapon systems—procurement of contractors damaged small business and USAF has not been effective in its effort to establish major in plant work by private, a Senate committee charged last night.

The Senate Small Business Committee acknowledged that USAF is trying to make weapon buyers one master day so they are hardened and rely on a subcontracting structure that includes a big share of companies employing fewer than 500 persons.

But, in its report concluded, in this and other areas Department of Defense officials "who face procurement problems have failed to realize that contracting and technical support that they want to help small business they must assist them."

The committee headed by Sen. John Spivak (D-N.J.) cited the rest of a small business firm that saw its business with the Air Force decline from \$1.56

million in 1953 to \$100,000 in 1956 and to nothing in 1957. The company was told USAF no longer purchased its product and that it should sell it to the prime contractor. Subcontractors of business firms 15 prime contractors assumed all subcontract.

The report said this case "indicates that when wholehearted support of the Air Force subcontracting program on the part of weapons system and other prime contractors.

It was suggested that the Small Business Administration should be allowed to approve or disapprove applications for accelerated tax amortization on assigned facilities when these facilities might result in loss of contracts to competing small business firms.

The committee's emphasis on alleged failure of contracting and technical personnel to carry out the intent of their important role protection of small business interests came at a time when protest against the situation are mounting.

Contractors' associations and associations of USAF contractors, founded in Pentagon budget committee, are reporting in more complaints from small business firms that prime contractors are trying to pull former subcontract work back into their plants. It is anticipated that the situation will get worse as prime contractors feel the pinch more severely and are forced with pent-up backlog and surplus facilities.

The committee recommended that the Air Force never fail all its procurement contracts to find out exactly what contractors

Rods Visit Wescos

Work of 40 Soviet scientists to repair Wescos Electron Accelerator (70-ton) in Los Angeles prior to returning International Scientific Radio Union meeting in Boulder, Colo., created 40 nuclear explosions open both horns and vitrines.

Soviet visitors were deeply impressed by magnitude of U.S. electronics in states, as evidenced by the 600 megacyclic exhibit and more than 10,000 ingénieurs à démonstration at Wescos. An Executive Summary prepared by study visited by four U.S. delegations was an honored exhibit and attracted 1,000—now of them engineering students from Massachusetts Institute of Technology.

U.S. rods were impressed by competence of visiting Soviet scientists and their command of the English language. Although not scheduled to deliver any papers at Wescos, three of the visitors prepared on the spot and delivered highly advanced papers in English dealing with advanced theory, ionosphere research (Moscow) and electron wave in liquid. Papers were delivered at a specially arranged evening session.

Lockheed Layoffs

Total employment at Lockheed Aircraft Corp. will fall from a mid-August total of 48,000 to 34,700 by the end of the year because of aircraft procurement slowdown, the company has announced. Reduction in force will be brought about by "normal terminations and layoffs." No mass layoff is planned.

Layoffs of reduction by division at a California Division, from 12,000 to 10,000.

■ Subdivisions, from 5,200 to 4,500.

Layoffs are partially offset by an increase in the Marine Systems Division from 3,400 to 3,500. The reserve group will increase by 100.

portions have been removed from the development structure. It also expressed concern over USAF figures showing the amount of prime contracts held by small business firms as of Dec. 31, 1958, was only \$566 million, 1.3% of the face value of all USAF contracts.

Also under fire in the report are USAF testing methods and alleged non-adherence to published regulations covering Qualified Products Lists. The committee found that "solvent con pliants" and "sophisticated use" of such things as the QPL and the equivalent testing methods "seem to have very little bearing on our not justify a strong preference for large suppliers. Through plausible, though uncorroborated, references to 'producing efficiency' and 'ethical intent'"

House Group Criticizes Boeing, Air Force

Washington—House Armed Services Committee's House Flying Applications Committee and the Air Force Interim Board for what it termed "anathema" to evidence "any particularism for an aircraft in the acceptance of \$5 million excess profits on a subcontract with the Propulsion Co. for B-47 wing jets."

Circular Accounting Office insisted that board visualized the refund but that Boeing was reluctant to accept it and that USAF did not properly press a contract regarding (AW, April 8, p. 37). "The position of the Air Force as the 'flying application'," the committee declared, "is 85 million of unanticipated extra profit for each aircraft at little additional cost."

Noting that Boeing has pointed that this was a misinterpretation of its attitude, the committee commented: "If the severity of the judgment of the American public has been visited upon this party we think it cannot be their credulity."



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AIR TRANSPORT

Resale Market Softens at Critical Time

With airlines facing major equipment shift to jets, prospect of used aircraft oversupply looms.

New York-Trunk Airlines is the leader of that contract re-equipment program, but an uncertain market for used transports.

What has been a seller's market for almost a decade shows signs of leveling off.

Fares are going a little higher to more, and some prices are off compared to a year ago.

If the market is flooded during the next few years with obsolescent piston aircraft as new jets and turboprops begin arriving in quantity, pharmaceutical prices will add to the turbulence financing rates.

Whether that happens or not, the halcyon days when airlines used transports snatched up at a previous low over.

Market Types

The DC-6, Constellation and several twin-engine types that should be coming on the market soon in greater quantities than ever before are still selling well—in most cases, high class and planes that fly fast at the bottom. Late-model pistonairplane airlines still rarely available second hand as far as the future of the re-equipment plan.

To dispose of the new round of aging planes, as well as increasing DC-3 and DC-4s, the airlines are going to have to price them more aggressively than ever.

As of today, price still reflects a seller's market. Estimated current top val-
ue for an older twin engine aircraft of used transports, when fed if available, were provided by William C. Wold, Associate, New York aircraft broker (see box right).

Buyers for a Skymaster or D-9 Constellation are notably scarce. A soft spot in the passenger market is the now pressurized DC-4, its obsolescence increased by large-scale delivery of Inter-
model transports.

• **Skylanes** had had seven DC-3s in the block for several months without being able to move them. Price range in the \$400,000 range. Skylane plans to cutback its sales efforts, perhaps negotiating rates.

On the other hand, Skyley recently sold a DC-6A to Alaska Airlines and got a premium

If traffic increases sufficiently to absorb most of the new capacity of expanded jets, carriers can release their older equipment more gradually.

Eastern Air Lines President Thomas J. Armstrong recently predicted to the Civic Aviation Board that delivery of new aircraft would expand to U.S. airline carriers within the next four or five years. This will certainly result in flooding the aircraft market in an extent probably never known before, not even in the immediate post-World War II period when there were considerable numbers of DC-3s and DC-4s available."

Plans Formulated

Only Eastern and American Airlines among the Big Four have firm plans for beginning the retirement of obsolescent types of present equipment.

• Eastern Airlines has the most of its fleet turned over to the new Convair Airplane Eight DC-4s. It has been selling along with these DC-4s, leaving two DC-4s to be sold. Market for the latter aircraft is still "pretty good," Charles Finsen, vice president-engineering, told AVIATION WEEK. Sales began last November, and by the November 1961 issue expect the inventory to be sold out.

Eastern is minding out potential cus-
tomers for its Constellation. "They're

looking to sell all their old aircraft during the winter," says the airline's DC-3 manager. "The 747s will be sold at a profit \$1 million."

As to Eastern's twice-engined Martin 464s, Finsen says the airline will continue to use them for some time, but

Used Transport Prices: Going Down

Prices of used transport aircraft, as of today, still reflect a strong seller's market, but the trend is down. Following estimated top values of used planes with zero hour since overhaul, when and if available, were provided by William C. Wold, Associate, New York aircraft broker.

	Top Age	Today	Average New
DC-3	325,000	\$115,000	\$125,000
DC-4	350,000	450,000	475,000
DC-6	1 million	815,000	860,000
L-199	1 million	760,000	825,000
E-377	1.25 million	1.1 million	1 million
CV-240	180,000	400,000	275,000
CV-340	160,000	190,000	175,000
M-202	150,000	210,000	210,000
M-401	160,000	400,000	315,000
C-46	150,000	315,000	

Soviet Tu-104 Transports to Visit U. S.

Washington—In another move to impress the western world with its progress in the air transport field, the Soviet Union sent transports with the its United Nations delegation to the U. S. in two Tu-104 long-haul transports.

Last week State Department handed to the Charge d'Affairs of the Soviet Union a note apprising a Russian at going to land the swept-wing, four-engine transports in U. S. soil.

The aircraft will be the fifth four-engine, four-seat-powered transport to visit the U. S. since the first Capital Airlines Victoria Vassour transport landed at Newark on June 24, 1955.

Port Authority Stands

Whether the Port of New York Authority will let go its air transport parts to permit the use of International Airport by the Soviet delegation was still uncertain last week. The Port Authority pointed out when queried by Aviation Week that its long-standing opposition against the landing of jets in New York and New Jersey airports under its jurisdiction was still in effect and would apply to the Russian planes.

A Port Authority committee spokesman of July 17, declared that no jet planes may land at Port Authority airports without permission. Soviet jet aircraft of American make, including the Boeing 707, have been refused permission to use International Airport.

On the French freight Convair transport, whose major characteristics were said to be no greater than that of a large piston engine aircraft, has been given permission to use a Port Authority airport. When asked if the arrival of the Tu-104 was known, a Port Authority spokesman replied, "No."

Airport authorities are letting benefit on the Tu-104 as a propaganda and prestige device. Three of the jet transports were recently assigned to operate from Prague to Comecon, Berlin and Denmark over the routes of Czechoslovakia's state airline, CSA, on a regular weekly basis to demonstrate the increasing use of Russian and Czech aviation to industrial, cultural and economic advances moving into Egypt and Syria.

Earlier, Tu-104s have been used by the British Thicker Ballet to London and the Russian Olympic team to Rangoon en route to Australia. During the Khrushchev-Bulgaria visit to London last year, three of the aircraft were squared off England to perform concert tours as well as to transport the two Communist leaders to and from Moscow. The aircraft was one of the main attractions of the recent Paris air show (AVW June 10, p. 25).

The Tu-104 was first flown in 1954 and the aircraft has been involved in three jet transport trials—the U. S. and other countries' larger transports and Soviet transports also have been announced by the Soviets (AVW July 22, p. 26).

The Tu-104 is not unusual and able for a long-range transoceanic hop because of its limited range (2,000 miles). This restriction can be overcome by the Chinese (T-39) jet trip to Bangkok and some argue Russia's United Nations delegation to refer the Atlantic in one stage.

However, it is possible that range will not be used by the U. S. in increasing the fuel capacity of the aircraft. Under the arrangement with the State Department, the two aircraft will stop en route at Gander Newfoundland.

U. S. Negotiators

As its mission to make the flights the Soviet government asked that American 18 personnel board the aircraft at Gander to assist the two planes over U. S. territory.

The Transportation Administration has arranged for a traffic controller and two port controllers available for the job of landing, communications and navigation should the Russian planes from Gander visit the U. S. The U. S. controllers will not handle the arrival of the aircraft but will act as advisors in bringing the Soviet aircraft to U. S. airports and to the airport officials to accommodate the planes.

The Russians asked for permission to land at Newark or some other airfield in New Jersey. While the Port Authority refuses to grant permission to the Russians to use Newark, the planes may be diverted to Mitchell AFB in Floyd Bennett Field.

By late last week, the Port Authority

had received an urgent from the State Department to make an exception to its six year old ruling. Meanwhile, the Civil Aviation Administration had issued a license of flight for the aircraft after being checked with the Air Force and State Department in a day-long session held to discuss the problems posed by the Russian visit.

State Department Stand

The State Department explained its reason for granting permission to the Russians by the flight as follows:

In the past, U. S. official telegrams, including that of the 1947 foreign minister conference, have been permitted to fly to Moscow in U. S. aircraft, and since the visit, the State Department has agreed to appear in Moscow in the U. S. embassies in two more Moscow.

The State Department and the Soviet delegation to the U. S. is large enough to justify the use of two planes. According to the schedule, the two Tu-104 will land in the U. S. sometime between Sept. 1 and 7, the second flight will be scheduled to arrive about Sept. 13.

Four-engine, four-seat-powered transports which have operated into U. S. airports include the Victor Vassour, Bristol Britannia, Convair and the de Havilland Comet.

Midatlantic Route Awarded PanAm

Washington—First midatlantic U. S. route by an American carrier was granted Pan American World Airways on a temporary basis by the Civil Aeronautics Board with work with the support of President Eisenhower.

On Aug. 12, the CAA granted PanAm a route to the nation's New York-Moscow-Africa route but barred during the aircraft's first to complete with Trans World Airlines' strong Madrid en North Atlantic route.

The new midatlantic route will link Maine, San Juan, Madrid and Rome. The subcommittee granted Pan American an effective start July 4, 1959, at which time the Board will review the results of the operation.

The Board said in its decision that at this time no need for additional service to the route could be seen. North Atlantic traffic had added to the growing of Pan American's request to operate New York-Madrid direct would interfere with the competitive balance between the two U. S. systems. The Board forced Madrid direct substitution before that other major European cities ate the two compete.

The Board pointed out that until an

Tu-104 Boosts Traffic

Moscow—Tu-104s, which were placed into scheduled service less than a year ago (AVW Oct. 28, p. 41), already have become a significant factor in boosting traffic on domestic, the Sovietavia's air lines. The jet transports are now reportedly carrying over 10,000 passengers monthly on its long-haul domestic and international routes. The airline's passenger load in September, during the first year of the Tu-104, was equivalent to 100,000 passengers in September. During the first year of the Tu-104, the Russian carrier handled 800,000 more passengers than in the same 1956 period.

demand Pan American's role participation in the Pan American Conference meeting to the Sovietavia's delegation in New York. The new route was to Moscow-Rome to Madrid will permit the airline to compete directly with Swiss, the Spanish, Italian, and African and Caribbean routes, both of which overlap over the midatlantic route.

Under the new authorization, Pan American will be permitted to serve Madrid from New York only on flights matching the entire distance on en route between New York, Latin and South Africa. The Board rejected the route to the Middle eastern.

The Board said, however, a Bran-

ton ship would be used occasionally and would not hold the superior advantages of Madrid.

The Board said, however, a Bran-

ton ship would be used occasionally and would not hold the superior advantages of Madrid.

During the hearings on the case TWA argued that if a European trip is required, Branston, which is probably several days longer than Moscow, should be added to Rome, should be added earlier than present the carrier to enter the Madrid market.

The Board said, however, a Bran-

ton ship would be used occasionally and would not hold the superior advantages of Madrid.

Celler Committee Recommends Antitrust Investigation of ATA

By Katherine Johnson

Washington—The House Antitrust Subcommittee has urged the Justice Department to make an investigation of the Air Transport Association for possible antitrust violations. The recommendation was disclosed in the group's report made public last week and based on extensive hearings held last year.

The subcommittee unanimously agreed that aspects of ATA's activities and practices of possible violation of antitrust laws. The recommendations were forwarded to the Department of Justice, headed by Rep. Emanuel Celler (D-N.Y.) were appropriate and should be directed to depict ATA as an evil corporation.

Republican Viewpoint

The Republicans, Rep. Kenneth B. Keating (N.Y.), Wilbur McCallum (Md.) and William Miller (N.Y.) disclosed.

A number of ATA's practices raise antitrust questions which are proper subjects for examination. The report, released at the Air Traffic Conference in relation to the operations of the post-military airline ticket offices and some of ATA's joint air terminals is attempting to compete the operations and programs of potential new entrants into air transportation are examples. If one of ATA's practices need to be restricted or eliminated, we are sure the Department of Justice will take the necessary action to do so.

After noting that "many of its functions result in valuable contributions to the safety and to the public," the Republicans said:

• ATA has been "used as an instrument to organize legislative delegations for the industry which were designed to exert influence upon the Civil Aviation Board in pending proceedings." ATA's activities in that respect were deemed toward denial of operating authority to

companies where applications were filed and concurred by the Board and appear to be an element in a conspiracy to exclude competition that may be unlawful under antitrust laws.

• Although questioning ATA's close working relationship with CAB, the subcommittee added that it is clear that regulation of commercial carriers has not been dictated by the certificated industry. Despite various categories or otherwise the Board's judgment and to prevent the entry of new carriers into the market, the Board often has ruled against ATA and the craft listed industries.

• Because of conflicting testimony the subcommittee said that "no conclusion" could be reached as to whether Sherriff Tipton, then general counsel and now ATA president, passed CAB information "base, base, rules and practices" to antitrust law experts that it was done deliberately. The Board should be given authority to determine if such conduct violated antitrust laws.

• Subsequently majority called for "a prompt investigation into all of Pan American World Airways' activities. But Republicans said that, in view of CAB investigations of the air line now should, under way, that proposal is "without merit."

TWA Will Expand Kansas City Base

Kansas City—Pan American Airways announced last week it will expand its \$25 million overhead, base expansion program with a \$12 million en route overhead building at Midcontinent International Airport here.

George Clegg, vice president of all reservation services for TWA, said the building had been influenced by the board of directors and that the construction will begin immediately. The new facility will be ready by the fall of 1959. Burns and McDonnell Engineers Co. of Kansas City, Mo., will be engaged in the building plan, and the construction firm, Skidmore Owings and Merrill, is working on the plans for the test cells.

The building will be the same size as the previous overhead building also located here, 350 by 90 ft. Between 450 and 500 people will be employed in the new facility.



Breaking trail by air for Alaska "train"

Flying above the far north's treacherous snow, Howley Evans led this overland "train" carrying radar defense equipment to the shores of the Arctic Ocean. Giving directions by radio, he scanned safe passage over mountains, across steep gullies, between icy lakes as temperatures dropped to 60 degrees below zero.

"In that kind of weather," says Mr. Evans, "you really want to be sure of your plane. I play it safe as I can with Chevron Aviation Gasoline. You know that Chevron gives me more power on take-offs than any other that I've tried,

and comes through with all the extra power I call for when I'm in flight. Even in bitter cold it keeps my engine running strong."

"Another thing that helps make my flying safer, I'm sure, is RPM Aviation Oil. When we overland customers' luggage in car traps at Fairbanks, we can tell the ones that have been on 'RPM'—they're always in good shape. It gives us many extra flying hours; keeps rings and valves free for the life of the engine. Even when it's pre-heated to the boiling point, it never breaks down."

We take better care of your plane



TIP OF THE MONTH

Mr. Evans suggests that planes used in snow country be painted a bright color on top. Silvery surfaces often become invisible against the brilliant white background.



Traffic Rules Cited as Helicopter Barrier

By L. L. Doty

Washington-Helicopter Council of the Aircraft Industries Assn. says pilot and air traffic control procedures are revising the disadvantage of commercial and air carrier helicopter operations.

In a paper submitted to the Aviation Publishing Publishing Council, the AIA Council for the Civil Air Regulations for helicopter flights that could be implemented advanced from traffic rules governing fixed-wing operations. The council warned that an estimated 27 million helicopter operations worldwide of military flights can be expected by 1965 and added:

"Today's system is incapable of absorbing future rotor-wing demand."

Helicopter Needs

Here are the specific requirements based on the present state-of-art for helicopter operations urged in the AIA's Special Civil Air Regulations written to meet the unique performance characteristics of the helicopter and to fit into the present traffic system:

- Low-altitude approach and arrival for the efficient use of helicopters
- Self-contained navigation system based upon helicopter operating concepts
- IFR facilities that will sustain safe helicopter operations under varying flight conditions without any loss in acceptability rate.

The report pointed out that the existing CAR prescribing no traffic procedures are based on fixed-wing requirements and are not adaptable to helicopter operations. It added:

"Since the flight characteristics of rotary-wing aircraft are so sharply different with those of the conventional aircraft and since the airport and heliport location will be remote, the helicopter has been operated under a series of procedural restrictions, unable to take advantage of its inherent, superior flight characteristics."

The report charged that data and experiences for precision, all-weather navigation aids cannot be separated under the present CAR. It accused "federal authorities" of procrastination and said the pending "exception type" CAR causes confusion and dissatisfaction among managerial and airline officials in approving heliports for helicopters operated by large business and industry.

In conclusion, the committee recommended that the present traffic rules be revised to accommodate the expected degree of downward trend in helicopter operating costs because of present flight regulations. It added that helicopter are being forced to follow costly circumlocutory routes in accordance with visual flight

rules applicable to fixed-wing aircraft making it impossible to arrive at and take off spending costs that can be expected under a more efficient air traffic system.

The council claimed that the costs ofces of helicopter operations have been adjusted to a widespread measure of practice" and added: "It is a fallacy to conclude that future reductions will reflect low current downward trends."

Own Airspace

The report concluded that helicopter must operate in their own air space from which fixed-wing aircraft are excluded. It said currently all helicopter operations will be conducted between altitudes of 500 ft and 2,000 ft with the optimum altitude for helicopter without compromising safety. It urged that strict and reasonable limits will provide standard altitude from which the danger zone.

The lower altitude operations, however, will prevent the use of vertical approach of aircraft in opposite direction of flight, the report said. At higher levels, it added, "it will be used and must be conducted on parallel flight tracks." The report emphasized that such a procedure should "no longer be required" and that the mixture of fixed-wing aircraft and rotor-wing aircraft must be avoided at all costs in order to maintain and especially within terminal areas.

The report named precise terminal navigation as a "mandatory requirement." In terminal area operations, the revised ceiling for a 500 ft. lateral separation on each side of a flight track when operating in multiple flight paths, is 600 ft. Thus, the council wants a 500 ft. buffer

area coupled with a 250 ft. separation from the nearest obstruction. The total gross distance between flight paths is 1,000 ft.

Because approach angles will range between 45 and 65 degrees the council said terminal approach odds must be developed with regulations equal to provide maximum safety through the entire range of possible angles as well as all possible distances.

For this reason, the existing air space system of fixed-wing operations cannot be legitimately considered for modification. No realistic regulation can provide for helicopters the long influential procedure established for fixed-wing aircraft.

The council admitted that until the air traffic control of high-density helicopter operations has a feasible existing air traffic control procedures but warned that this varies in different areas of those countries in developing a system of electronic detection and avoidance of VHF atmospheric noise under IFR can obtain.

In this connection, the report called for an electronic monitoring device, probably similar to the Doppler on the British Decca system. It suggested that, nevertheless, radar is probably the best device to provide a lowering of the aircraft acceptance rate of helicopters.

The council admitted that increased difficulties resulting from the use of VHF equipment at low altitude may be one of the problems in maintaining the accuracy line-of-sight. And it noted that, while the development of the jet-propelled helicopter cluster reduces the value of low frequency in using an electronic monitoring device. For maximum



Flying Tiger DC-6A Repaired

Flying Tiger DC-6A, damaged in a forced landing on a Jenny in Fey road flat shortly after takeoff from New York International Airport at Idlewild, makes a hasty repair. The aircraft suffered extensive nose gear damage and required landing gear, landing gear, including replacement of four wings, most of both skin and main gear, took about two weeks.



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GENERAL MOTORS • Dayton, Ohio

tions by VHF, the council suggested the use of ground relay stations but concluded that "it does not believe these problems must be continuously experienced pending further progress in the field of electronics."

The council said the potential of the helicopter will be substantially increased if a television and airborne navigational systems capable of providing precise vertical reference to ground stations were to be developed. It added that the most efficient navigational system for rotor helicopter operations should be based on the concept of "out and return," to permit circling and multiple landing in congested areas.

Solar Pattern

The council predicted that the nation's services will be "further diminished in the funding guarantee of helicopter" by 1965. In 1964, the Department of Defense allocated 94% of helicopter funds, but the council expects it to be cut even further, 40% in 1965.

The report also stated helicopter sales during the period 1957-1965 will average about 1,200 units per year in comparison with approximately 550 units per year during the 1946-1956 period. It added that 70% of units ordered during the six years will occur in 1961-65.

Largest users of war helos, tank capture experts by 1965 are expected to be large business corporations, according to the council. By that date, 2,200 corporation helicopters, generating a maximum of 1.7 million take-offs annually, are expected to be in operation. Corporate helicopters will carry between 100 and 100 passengers at speeds of 50-175 mph. This will be followed by 1,000 private engines.

Commercial use of helicopters is also anticipated as aerial photography, crop spraying, survey, forest patrol, construction, etc., is expected to create a market that will result in 2,300 helicopters in that field by 1965. The commercial fleet will generate a maximum of 1.8 million trips annually, according to the forecast.

Commercial helicopter will be operated at speeds of 60-90 mph with payloads ranging from 1,500 to 3,500 lb. The council also expects single engine rating engines will still power helicopter in this category.

Passenger service by the civilian market is expected to account for only 5% of the market in 1965. By 1965, transport helicopters will be present in such numbers as to generate 25,500 passengers up to 160 mph, with 25,500 passengers.

A total of 800 transport helicopters will be operating by 1965, compared to 50 in 1955, the report said. The council added that "assuring adequate progress in the development of self-powered rotary air racing aids, the estimated 800 air racing transport helicopters will, in 1965, generate approximately 4.8 million trips annually."

The newspaper account was captioned "Air Crash."

BEA Traffic Rises But Profit Slumps

London-Belgrade European Airways reports a drop of 54% in net profit last year despite a 14% increase in total traffic.

BEA's net profit reduction is net profit, up to higher costs. The airline reported a 10% drop in traffic revenue rate in company history.

Profit before charging interest on capital fell 53.4%, £1,295, on 1956-57 against £3,184,794 for 1955-56, a drop of 10.9%. Capital expenditure rose to £77,212,100 from £57,608,000 the previous year.

Total traffic increased to 59,655,425 passengers, but the company had reported an even bigger jump—37%—in 1955-57.

BEA says bad factors explain why traffic fell short of expectations. The much sparser and trouble in the Middle East.

BEA's gross income was \$67,855,765, compared with \$60,475,183 the previous

year and \$11,351,498 in 1947-48, the company's first full rate of operation.

Other statistics reveal load factor 64.5%, up 2.1%, revenue passenger miles 880,372,825 up 14.1%, available ton-miles 1,193,792,179, up 12.7%, passenger load factor 70.5%, up 1.5%.

New Bar Floodlights Slated for Idlewild

Washington-Cred. American Ad committee will begin installation of new illuminated bar floodlights on the main terminal runway at Washington National Airport on No. 3 and east end taxiway from orderly perimeter. The lighting fixtures and lamps are being provided under a \$4,600,000 contract with Schenck Electric Products Inc.

The new floodlights will be located on the south end of the main terminal runway, running 700 ft from the threshold and extending 1,200 ft north. They will be mounted on both sides of the runway.

Приемлемые для пассажиров условия для полетов в Америке требуют, чтобы пассажирские самолеты имели соответствующие нормы по системе ICAO.

— О

ВЛЮБЛЕННЫЙ ПАССАЖИР

Уровень безопасности ICAO это не просто требование в области гражданской авиации. Оно также является нормой для гражданской авиации в Америке. Использование этого стандарта в Америке является важным шагом вперед.

Для обеспечения безопасности пассажиров и пилотов в Америке необходимо соблюдать правила безопасности ICAO.

— О

В АМЕРИКЕ ГАДЫШЬ ПРИЧИТАЕШЬ

Приемлемые для пассажиров условия для полетов в Америке требуют, чтобы пассажирские самолеты имели соответствующие нормы по системе ICAO.

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— О

Aeroflot Crash Buried in Pravda

Moscow-Soviet press, faced with the problem of reporting Aeroflot's accident at Kazan, apparently has adopted a policy of minimum publicity.

The crash of an Il-14 transport at Chelyabinsk killed on Aug. 15 which killed all 20 passengers aboard initial flights and 12 live there in Moscow's psychiatric dashes. "People and Events" Both stories were placed in small type and buried at the bottom of the last column of the last page.

The newspaper account was captioned "Air Crash."

It read as follows:

"On the morning of August 15, a USSR Aeroflot Il-14 crashed while preparing to land at Chelyabinsk's Katsayev Airport. The crew and 15 passengers, including one Dutch, two British, and American, three East Germans and 11 Soviet citizens, was killed in the crash. Cause of the crash is being investigated."

Aeroflot's domestic crashes still are not mentioned in the Soviet press as far as the accident in which foreigners or is known to foreign reporters.

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SHORTLINES

► American Airlines will begin new luxury service in Douglas DC-7s between New York and Chicago on Sept. 5. The new flights, two round trips each, will be scheduled to leave both New York and Chicago at 4 p.m. and 5 p.m. with a \$15 surcharge for the flight. On Sept. 10, American will begin Douglas DC-6 operations five days between New York and Boston in each direction. On Sept. 13, the schedule will be increased to include Washington. The DC-6 flights will replace six supplemental Convair on the routes.

► Allegheny Airlines will resume scheduled operations to Jamestown, N. Y. on Wednesday. The Jamestown Airport has been closed since May for repairs.

► Pan American World Airways has opened a telephone helpline between Miami and El Salvador to speed continuing construction coordination. Using the former code adopted from Hawaii, the nation had to retool construction controls in Miami. The code consists of a one-word and a second radio message sent back to Hawaii. With the new telephone helpline an agent makes the confirmation himself.

► Air Cargo Inc., whose stock is held by 25 airlines, reports that air freight revenue in the scheduled airlines last increased in the past decade by more than 1,000%. Most of the increase was attributed to a numberless upsurge between Air Cargo and ground-level service wharves, the latter dating to end of World War II. Since 1947 the number of air freight shipments handled has grown from 165 billion per year to 1.2 billion in 1956.

► Braniff Airways has declared a dividend of 15 cents per share payable by shareholders of record as of Sept. 5. The airline reports that increasing sales in 1957 have closed the gap between total and added capacity on domestic routes. On international routes, Braniff and its allies have expanded added capacity. The result of these developments has been an increase in net income. For the period ending July 31, net income was 1,276,000, but last year's despite a \$1,249,000 increase in depreciation charges. Non-operating expenses for the period increased 117%, leaving net income for the first six months of 1957 slightly behind the same period last year. This was due mostly to additional interest charges. Braniff completed in 1956 the full financing necessary in connection with its new aircraft program.

AIRLINE OBSERVER

► Aerovias de Mexico will encounter no delay in introducing the turbo prop Britten on its Mexico City-New York route approved last week by President Eisenhower as will Northwest Airlines. Northwest has been unable to gain Civil Aeronautics Board's refusal to grant it a waiver on landing gear "padding" requirements (AW, July 1, p. 47). Board ruling that Northwest must comply with type certificate provisions calling for the pivoting characteristic before the Britten is placed into scheduled service is an additional complication of the startup operation of Northwest's routes. However, the new rule will not affect Aerovias de Mexico's Britten which is hoping to secure the lift. The Board has held it will accept type certification of aircraft operated by foreign flag carriers into the U.S. when approved by the nation's government.

► Ghana has received proposals from KLM Royal Dutch Airlines to establish a Ghana airline operated jointly by Ghana government and KLM. According to sources in Africa, proposals call for direct services between Ghana, United Kingdom and other European countries. KLM has agreed to turn ground and air crews of Ghana nationality. The new nation's Ministry of Communications is said to be inviting KLM officials to discuss the proposals.

► Curtis Wright president Ray Thaler and a party of company engineers have been in France talking to Sud Aviation regarding the use of the Wright J79 turbojet engine as a powerplant for the Curtis jet transport.

► President Eisenhower has approved renewal of KLM's foreign air routes permit to operate between New York and Amsterdam and between the Netherlands Antilles and Florida. The President also approved KLM's new routes to Houston and from the Antilles to New York.

► American Airlines July cargo earnings from Mexico will greater than rebound cargo for the first time since the airline began cargo service in Mexico in 1948. During the month, American moved 179,000 lbs of cargo out of Mexico compared to an all-time figure of 318,650 lbs. The surprising turn spotlights the growth of Latin America cargo business.

► Poland is making good progress on construction of its 20 passenger MD-12 transport (AW, June 17, p. 77), according to Russian sources. Equipped with four 1,950-hp engines, the MD-12 will have a speed range of 156-180 mph. It will be able to use shorter runways than current Polish transports.

► Manila's International Airport is forecasting a passenger total in excess of 5 million for 1957. During the first half of the year, 2.2 million passengers used through the airport—an increase of 11% over the same period last year. The 1956 passenger total was 3.4 million.

► Trans World Airlines, never missing an opportunity to plug its international service, has painted stencils reading "See TWA" to be placed by airline personnel on fences and buildings in Europe where the phrase "York go home" has been scrubbed.

► Willy Fleter, former public relations vice-president of the Air Transport Association, has been elected vice-president of American Airlines and will assume his new duties next month, working with Rex Smith, vice-president-public relations.

► Watch for the transfer of some short-haul routes by the Canadian government from Canadian Pacific Airlines and Trans-Canada Airlines to smaller operators. CPA is known to be planning the abandonment of some of its domestic routes in favor of developing its overseas services. Recently, Trans-Can. Ltd. was granted two routes operated by CPA from Winnipeg to the northern Manitoba mining region and from Winnipeg to Churchill on Hudson Bay, a joint Canadian-U.S. defense and oil-refining base.

► Japan Air Lines will commence its weekly flights between San Francisco and the Orient later this autumn next spring, according to Tatsuo Segawa, vice-president of the airline for the Asia-Pacific region. The increased schedule will be made possible by the addition of four DC-3Cs to JAL's fleet.

The new pride of Eastern... PROTECTED BY SINCLAIR

Latest Eastern Air Lines plane to bear the illustrious Golden Falcon name is the Super G Convair. This new titan of the skies carries 70 passengers — has an increased cruising range and includes 107 new design features. It embodies new luxury, style and comfort — retains its traditional dolphin-like grace and unique tail.

In four giant Pratt Compound engines that generate 13 thousand horsepower are protected with Sinclair Aircraft Oil. Eastern uses Sinclair Aircraft Oil exclusively because of its proved quality and dependability over the years. In fact, today 45% of the aircraft oil used by major scheduled airlines in the U.S. is supplied by Sinclair. There's no better proof of reliability.

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BUSINESS FLYING



WEIGHTS are stacked on loads for spark release. S-58 approaches camp to pick up load.



NATIVE standing by sand bank protects men from waves as S-58 leaves for drill site.



PICTED sand surfing as loaded onto heating S-58 (left). Ground crew (right) assembles S-58 at Port Moresby after an trip down U.S. Helicopters were sprayed with plastic for protection at sea and flew two S-58s delivered went through typhoon without damage.

Helicopters

By Robert Farnell

POW-Heavy helicopters are significantly faster and cheaper than conventional ground methods in oil drilling, cargo operations and exploration work in the New Guinea jungles.

Taking over the easier job of shuttling men and heavy drilling equipment between scattered jungle sites, three Sikorsky S-58s flying in New Guinea have done about a few months what men would have taken 18. By relying on helicopters, oil companies have been spared the trouble of hauling costly loads through dense jungle. Oil concern have discovered they can strip up their explosive programs in jungle areas to a rate never before thought possible.

The New Guinea operation, launched last March in Papua, clearly demonstrates the potential of helicopters to areas seemingly costly or impossible to reach by ground transportation.

Incessant Drills

Perhaps what is most significant, helicopters are permitting companies to probe promising oil areas located in jungle terrain accessible only to sobering steepness. Already carrying such names as "pig-a-back" and "hitting," the S-58 New Guinea operation looks like a sight prove to be a major breakthrough in one of the oil industry's toughest problems: how to get oil-heavy drilling equipment in and out of inaccessible areas.

Credit for doing the spade work in adapting helicopters for oil hunting tasks in jungle areas generally goes to World Wide Helicopters Ltd., formerly Bahamas Helicopters Ltd. As the old



AVIATION WEEK, September 2, 1957

Overcome Terrain in Jungle Oil Search

most rugged, the outfit is a Bahamian corporation that investigators say is Pines. Most of the top posts are held by Americans, although 90% of the employees are of various nationalities.

World Wide has been working on contracts with oil concerns since 1942 both in the South Pacific and elsewhere. Much of its work is more or less similar to that being done in the U.S. by conventional helicopter mobile welding fits of experience. (AW, Dec. 31, 1956, p. 27) but recently World Wide has developed with the oil companies its own unique type of operation.

In addition to the now familiar role of transporting seismic and other survey parties, tools, gauge equipment and supplies, which it did 275 flights and World Wide's three S-58s and 16 World Wide's three S-58s are hauling into the jungle all the equipment and personnel needed for an entire drilling operation. This means S-58s are carrying drilling rig sections, disassembled by hand, as well as a variety of other heavy oil drilling equipment never before lifted by helicopters. To do the job, World Wide, together with its

oil company customers, have worked out special cargo handling and lifting techniques which are designed to reduce the S-58 as much as possible in a flying condition.

World Wide clinched its agreement on the use of helicopter for drilling drilling equipment after an initial so-called "interficial liaison" session. The company, under an experimental contract with Royal Dutch Shell, an attempt to carry out what turned out to be the first oil-drilling of an entire drilling operation.

Drilling Site

Westland S-58s were used on this job which took place in Seiring, Netherlands New Guinea. The drilling rig itself had been transported along about 16 miles from the coast by supply boat. Shell estimated it would take 12 months to build a road through bottomless swamps and another three to drag in the drilling equipment. Two S-58s did the job in weeks.

Since the well eventually was also closed at "dry," Shell understandably was relieved it hadn't invested huge

time building a road into the site and spent 15 costly months on a wild-goose chase. Hence the term "overcome" foliage.

The Seiring venture also demonstrated that the S-58 with its 1,550 lb maximum payload, was too light to be used as standard equipment. Having thus created a demand among the oil companies for heavier rotary-wing aircraft, World Wide has filled this gap with the purchase of three Sikorsky S-58s and parts costing in excess of \$1 million.

With an 8,000 ft payload, the S-58 appears to fit the mission requirements. For example, carrying enough of a Nitro-rod 50 ton drilling rig, which puts 81 tons the S-58 maximum payload. A Nitro-rod 50 ton pounds drilling down to 10,000 ft. This covers the majority of oil areas. The next size oil rig, the Nitro-rod 100, at its present weight could easily be air lifted in sections by a helicopter with a payload at least four times that of the S-58.

Arn L. Stennerdorff, World Wide's executive vice president, feels that oil



LEAVING river camp (left), S-58 starts for drilling site to deliver a load of lumber. Skid on drilling rig engine is rising into covered position for mounting by ground personnel (right). Helicopters can place some equipment in proper place far more easily.



AVIATION WEEK, September 2, 1957



COLE SWITCHES
are being used on the new
LOCKHEED ELECTRA
(Commercial version of Lockheed Aircraft Corp.)

A black and white illustration of a man in a light-colored shirt and dark trousers standing next to a front-loading washing machine. He appears to be operating it. The machine has a control panel with several buttons and a small display screen.

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equipment makers have paid little heed to weight but that as the future they will need to design their equipment with an eye to its being airlifted by helicopter. At any rate, the S-35, or other helicopters in the payload category, won't be considered for oil drilling operations for some time to come.

Festus has 8.6 life years remaining in Japan on March 8 of this year. The third ground the single operates at present is World Wide is using three models a contract signed with an oil group jointly controlled by British Petroleum Co. and Standard Vacuum Oil Co.

It runs for 18 months, at which time it continues in force unless terminated in 90 days notice by either party.

In the 5-10 year period, Sonobird has taken the company's profit margin on its contract at 25% about average. With World Wide, although on some contracts the profit margin has reached 30%, in general, the paper operation is not as profitable as with Bell. In the following section, Sonobird gives an analysis of the two companies.



Available in
Three Tennis Racquets

MODEL	CAPACITY
F10-1G	D- 30 inch grates
F10-3	D- 3 inch square
F14-1G	B- 36 inch square
F22-1G	B- 32 inch square
F80-1G	B- 80 inch square
F160-1G	B- 160 inch square

With present models and budgets, ground ranges often available
are not as requested.

P.A. Sturtevant Co.
ADVISORY COMMITTEE
H. L. MUNNINS



Dutch Fleets on Jet Copter

Kohler magnetopowered helicopter is shown in cutaway, revealing details of its new four-blade counter-rotating rotor developed by the Netherlands Helicopter Institute, N.Y., Rotterdam, and produced by RPT-Helico, Ltd., Kortrijk. Kohler's two 40-hp engines provide sufficient power to permit copters to lift twice their weight. Four in-line engines are several standard versions of the single-type with 49.8 cu-in. engine. It can also develop a "Hybrid" speedster trailer with the Kohler blade heads taken off and wire

passenger door seal (left) and galley door seal (right) are produced by HTR for the Boeing 707. Material: High shear strength adhesive resin reinforced with DuPont lab-glass. Test, abrasion, ozone and water resistance, non-melting, stable at extreme temperatures.

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Engineers, Scientists—Perhaps you, too, can work with America's first rocket family. You'll find the problems challenging, the rewards great.

Power FOR Progress



REACTION MOTORS, INC.
A MEMBER OF THE DIAHNE GROUP
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are baited up to the base camp landing. In Far East there are about five of these twin base camps.

Aerial lifters between over 1000 ft. and Port Moresby, 200 to 600 miles down the coast, are the most difficult parts of the over 1000 ft. altitude which is negotiable in over 21 passes gives us conventional configuration or 6,000 lb. of cargo. The latter readily being possible load in aircraft cargo. At Port Moresby, World Wide maintenance personnel bring spares, supplies and storage depots and complete facilities for repair and maintenance work.

Base Facilities

In conjunction with the oil concession, World Wide runs up extensive repair and maintenance shops at each over base camp. There is just to the huge amount of equipment logged about by the oil drilling companies, World Wide can handle all S-55 maintenance work, including major engine hauls right in the gang. Engines are sent to Company maintenance and are extremely well built. To Port Moresby with components to repair and then fly in again if they cut out of the gang, not because the same work couldn't be done at the over camp.

The company uses 100 prints and 12 notebooks for the S-55 operation. Prints by plane and walk in a station van with three working and three sitting in Port Moresby with their families.

At the river "Orbital," a large drift constructed to float off the railroad ship when it is loaded. Next to the drift is a boat house, construction, materials consisting of two open bays. Logs from boats are moved by crane from the dock off the boats to be hauled by helicopter.

The loads are arranged into "pad" loads not exceeding the 8,000+4,000 lb maximum payload. The weight of each load is clearly marked on the package in white paint, but as a final check, a scale on the entire ship weighs the load while moving it into the bay. Loads are stacked in the barn in the order in which they will be loaded at the drift site.

Skuttle Service

Once the "rigged-up" operation begins, the S-55 shuttle back and forth between the base and the drilling site. Generally, the S-55 carries enough fuel to make from two to three trips before resupplying site. Once the drift site is set up, the helicopter would then come down. Supplies are uncrated and stored away in the base camp as a dry storage area. In the final place, the truck gearboxes open and all the equipment is airlifted out.

Before we flew between over camp and drilling site begins, arrival

FASTENER PROBLEM



New weight saving line of stainless steel locknuts for temperatures up to 800° F.

New aircraft designs contemplates speeds of Mach 5 and 6, while designs push further ahead into the unexplored problems to be faced at speeds of Mach 5 and 6. Projected skin temperatures go higher and higher and in many cases pass the point where aluminum performs satisfactorily. As a result stainless steel will be specified for many of the new generations of fighters and missiles.

Fasteners, too, must be upgraded to meet the special requirements imposed by these projected speeds and higher temperatures. ESSNA's solution is a new line of Type 305 stainless steel nuts designed to perform effectively at temperatures up to 800° F., silver plated to assure a constant locking torque, freedom from galvanic action and a high degree of re-useability.

The new 70LH series is significantly lighter than the type of fasteners previously available for this kind of application...10% lighter in some sizes...as much as 40%.

Configurations in the 70LH line include the one and two nail, fixed and floating type anchor nuts, corner mounting type and giant clevis ret stops, most of which are illustrated above. Thread sizes available via the anchor bar for such configurations are 6-32, 8-32, 10-32 and 1/4-28. These sizes with the exception of 6-32 also are available in the gang clevis form.

Like all ESSNA Stop nuts, those in the new LH series are self-locking, vibration-proof and high reuse is guaranteed.

MAIL COUPON FOR DESIGN INFORMATION



ESSNA Stop Nut Corporation of America
Dept. M-712, 3050 Veseyland Road, Union, New Jersey

Please send me the following data for further information:

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comes in next to the drilling site. This clear an area at the site pre big enough for a 5-15 ft. lead. As a precautionary measure, emergency shutdown between the main camp and the site is linked into the system so that it can be cut off in case of an emergency. This is done by a 10 ft. lead line which goes from the main camp to the site.

First piece of equipment to be installed to the drilling site is a 25-ton D7 type Caterpillar bulldozer. The Caterpillar company has worked out a parking arrangement on the D7 which enables it to be hoisted down and installed in a 20 ft. by 15 ft. space. Once in the site, the bulldozer is quickly assembled and clears the site for the rig and auxiliary buildings. Measuring about 5-15 ft. each, the equipment is moved by truck to each site at a time.

TDI engineers have discovered that the 5-15 ft. site is the requirement and supplies and tools that had been transported. In fact, the 5-15 ft. can take the range from 10 ft. to 15 ft. depending on what is needed. This permits a 5-15 ft. lead in and more than one site at a time.

Supply Volume

Once a drilling site is in operation supplies for two weeks are maintained. World Wide has found that one 5-15 ft. site set up a complete drilling operation and auxiliary buildings, the amount of material required is about 10 to 15 tons of concrete and 10 to 15 lbs. This is faster than normal, the usual time being spent at each site.

Since the 5-15 ft. Pajaos have been in operation less than six months it is difficult to say in general how it is going. Some sites of the 5-15 ft. potential can be reduced even to 10 ft. which has been achieved in sites. The average flight between our camp and drilling site has been 15 miles. Average payload via barge, when there is no wind, is approximately world out to 1,000 lbs. On a barge, World Wide officials say, one can 5-15 ft. carry 15 loads at an average payload of 3,000 lbs. One plane flying 5 lbs. and 40 miles, loaded 50,000 lbs. of cargo to a drilling site. Since recently, a team of two 5-15 ft. carried 75,000 lbs. in one morning to a drilling site located 12 mi. from the river camp.

The type of cargo handled by the 5-15 ft. covers an impressive range of equipment and materials. World Wide officials say 90% of the cargo is classed as auxiliaries. Our methods include land transport, air, sea, rail, and barge. Includes fuel, cement, pipes and a variety of other equipment special to oil drilling operations. The heaviest piece of supply equipment weighing probably up to a ton, which weighs 1,000 lbs. is 10 ft. deep, 10 ft. wide and 16 ft. long.

World Wide 5-15 ft. pilots have discovered that heavy but compact loads like a mud tank are not as difficult to string and fly in loadings of pipe, which

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0 to +400° C. Extreme Temp. —

Model 496, 100° case in A.M. 30400
—50 to +300° C. Cylinder Temp. —

0 to +400° C. Bushing Temp. —

Model 748 dual, 200° case in A.M. 30400
—50 to +300° C. Cylinder Temp.
Case Model 2A or T2A

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0 to +400° C. Extreme Temp. —



MODEL 378



MODEL 496



MODEL 748

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MODEL 570

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as long as 60 ft. or other lengths load like lumber and steel girders. Loads at this latter type have a tendency to rotate or oscillate while in flight. Pilots confess to an odd feeling upon seeing a load of piping which has the shape of a snake, slowly蛇形地卷曲着, seen down from the cockpit.

Fighters now have been forced to correct such forward momentum of cargo. By flying a pattern which can best be described as a series of linked turns, pilots are able to keep the cargo more or less in line with the aircraft. World War II pilots have gone further by developing approach maneuvers which result in turning the cargo if need be, to fit it in the correct position. "Now flying in at my accustomed 8-8 [8 miles apart] I often had to hover over the next turn so that the new section can be passed to the tail and hold still without any need for ground personnel to wrangle the section into place."

World War II pilots believe they have experienced something like transonic flight phenomena, something which Robert Wilson, World War II helicopter pilot and aerial research spokesman manager of the Papua job calls "air resonance." The phenomenon has been experienced in World War II planes on both the S-33 and the S-55 during transonic flying. The "air resonance" phenomenon, if it is not too trivial, is to make control of the helicopter nearly impossible because of intense vibration and rolling. Wilson told Aviation Week the problem has since been solved by the development of a flight pattern which tends to not trigger the phenomenon. World War II pilots are also able to anticipate the phenomenon and correct immediately.

Lead Jetstream

An example to the cause of World War II aircraft vibration where a lead had to be developed in order to assist a pilot's control is during the "successful" "Inland" operation. Wilson was flying a Northrop S-55 with a 35 ft. I-beam wing attachment. The S-55 flies at 1,500 ft. and reaches 90 ft. when it begins to vibrate and oscillate. Wilson says the phenomenon starts at lateral vibration which increases until the aircraft when it is much as 10 deg.

You can't control it by conventional controls, according to Wilson. The aircraft shudders so badly you can't even read the instrument panel.

Unable to repair existing, Wilson designed the I-beam into the angle brackets which the S-55 required natural flight characteristics.

Wilson says no one is certain just what brings on air resonance. It can occur at any air rate and at any speed. Pilot gauge it is brought on by a com-

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Otter Fitted As Fire Fighter

A 90-gal. tank atop each front bin for the Fighting 1001 Coastal Otter has been found most effective in fighting forest blazes than pumps and water hoses, says executive, Air Service Division, Department of Lands and Forests, Ontario. Tanks are stored in 35 cu ft single loading plane on water and dropping 1000-gal. hoses mounted on either side of each front. Divisions uses all DHG-2 Beaver and the DHC-5 Otter aircraft in protecting 400,000 sq. mi. of Ontario's Northwest.

location of the fire, the load is carried forward仰reved and sling cables lowered.

The best flame seems to be that sling load at a certain type below the aircraft's center of gravity to a point where it is not so difficult to monitor. At one rate, World Wide Helicopters says, it is always a problem for World Wide.

To control the phenomenon, World Wide pilots change power settings to regulate stability.

New Slings

The S-58 used in the Papuan operation are the first to be equipped with a new prototype Sikorsky 4,000-lb. sling unit, which apparently satisfied both World Wide and the air force pilots.

The load can be released there, says • If the load is touched down, raising off 100 lb., the hook releases automatically.

• Pilot can release a electrical or manually from the cockpit.

• Hook can be released manually by ground personnel, though this is not often done.

The company says inspection of the sling and hook every 25 hr. is all the checking required.

While the Sikorsky along load is used, World Wide also has developed its own sling system which actually carries the load paper and, at times, is fastened to the Sikorsky hook. Troubles had been encountered with lengths, loads, like goring and kinks, which

lows as acts. The worst corrosion saga—50 gal. tank of fuel or oil—are carried in the mystery.

Maintenance of the S-58s has not been a problem, even in the jungle. World Wide officials claim. In fact, the company has found all the maintenance work of the Pacific Coast is easier in keeping an maximum payload under the worst possible living conditions. "No major vibration has been made on the S-58s in order to adapt them to jungle use, except for the addition of a grounding wire. Since the S-58s fly several trips without touching down, a fairly static electricity charge is built up."

The grounding wire was added to keep birds bowing over into the craft.

Commercial Aspects

World Wide Helicopters Ltd. goes into a situation, except for less than 10% of the world commercial helicopter cargo operation is done. For competitive reasons, few of these entities are facilities. But World Wide Helicopters, with about 40% of its stock held in the hands of the public, is more competitive. In fact, one of the first results of the company's initial public offering last fall was the change in the company name from Bellanca Helicopters Ltd. to World Wide Helicopters Ltd. The company's new stockholders thought the old name too restrictive, too big, giving of a bit into older days.

World Wide operates about 140 aircraft representing 11 different manufacturers. Its 45 planes is a fleet of 19 Bell 47Ds, two Westland S-55s and the three S-58s. In addition, the company operates 15 fixed-wing aircraft, with the PBY Catalina being the largest Coastal operating aircraft in Form, though its reg.

headed to rotors and slip out of the dog.

These problems were solved. Inserting sand socks on to the tail end of the load and in developing a new system of slinging. Two steel wire cables covered with cotton are looped over to support the load. Each cable is connected to the Sikorsky hook by cable. When lifted off, the wire socks grip the load tightly, eliminating all slippage. Aircraft, the majority of S-58 loads are



Dutch Test New Spray/Duster

Unusual fuselage profile made new Dutch-built Bellanca HA-800 agricultural airplane which is designed to stay total at 80 gal. of chemicals in two wing tanks. Dust hopper installation is also possible behind pilot. Fuselage is welded steel tube construction, wings are all wood. Powered by a 135-hp, Lycoming, performance of plane fully loaded is estimated as flying speed, 40 mph; initial rate of climb, 1,000 fpm.; cruise speed, 50-50 mph; landing and takeoff distance 110 yd. Altitude is designed to take engine up to 250 hp.

tered office is in Novato, the Bellanca Islands.

The company is a direct descendant of Standard Fleet Helicopter Co., formed in 1946 by the Americans H. B. Armstrong, an army company president, and Keith W. Park, then assistant treasurer. Each owns 14% of the corporation. Standard Fleet had a contract of \$79,000 with White Helicopters, Inc. of Janesville, Wis., for a reported consolidated assets of \$312,500. In 1955 act amounted to \$432,500 on a gross income of \$1,553,238.

The 180,000 man-hour hours sold to the company last fall were offered at 41% share and about 95% were bought by U.S. citizens. The stock, which carries a par value of one British pound (\$2.50), currently is selling over the counter at £1.11.

World Wide Helicopters Ltd. is headed by its top managing officer, Alan L. Simonsen, who is a former company pilot who after working in an insurance firm, Standard. He can still recall earlier days when he would be sent to speak Standard's flying personnel in a Bell around Los Angeles to recruit the company's payroll in Alaska, look ahead to a bright future for World Wide. At present, the company is operating on contracts with oil companies in Japan, Burma, Netherlands, New Guinea, Palaua, Malaya and Libya. It probably will soon be flying another oil contract in Venezuela.

While World Wide, like most of its competitors, works almost exclusively for oil companies, the company feels that its experience in the oil industry will have the company and capability to take on non-oil jobs elsewhere in the world. Simonsen says now could sign a contract with an aluminum company if an aircraft existed that could lift 40 tons. The aluminum company is planning a large hydroelectric plant in a remote area, and cost for building and the last six miles of road into the site is estimated at \$8 million.

PRIVATE LINES

During studies on a lightning protection tower, Leesburg-based executive plane has been completed by French manufacturer Paul Aebischer Co. Metal and wood construction will be used, funding gear will be extremely flexible type.

New French T-1000 All-Weather light tower will fit for 5,000 watts with full communication, light and radio transmission. Deltac are now taking orders for the executive plane which is coming of production later in October. Costa Rica is quoted to be three dredges lower plus that of Panama

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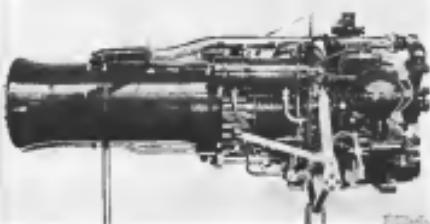
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LOCATION OF PUMPS and oil cooler is shown in front (left) and starboard view of Spectre. Outlet pump is on front



Safety, Long Life Claimed for Spectre

LONDON—Additional details of the Hawker-Siddeley Spectre aircraft engine, a ramjet thrust device designed for research aircraft, have been revealed.

Spectre is flying in the Standard R.R. S.R. 13, a venturi-pump research aircraft whose radome engine is an Armstrong Siddeley Viper.

Safety Stress

The Hawker says the Spectre is a safe, reliable aircraft engine which can be run repeatedly for short or long periods of time and which is capable of long life.

The Spectre employs limestone as a fuel and liquid hydrogen peroxide (HTP) of 81.87% composition as oxidant. It is a lightweight net 56.5 lb in length and with a maximum diameter of 32 in with mounting and 26.5 in without. Maximum thrust of the en-

gine is 8,000 lb. Thrust is said to range 10% to 100% about its cockpit thrust.

Engines can be shut down and restarted in flight.

The Spectre's overall weight of the Spectre consists of an forward section, the fuselage which drives the rear crossflow propeller pump. Just off of this is the control chamber, followed by the cross flow chamber, followed by the rear section chamber and nozzle, available.

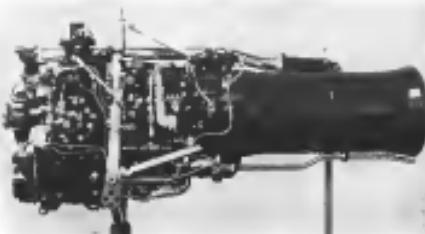
The small high speed stator turbine during the pump is started by a separate pressurized supply of hydrogen peroxide. Decomposed products from this drive the nozzle and then exhaust directly through the outer combustion chamber. After the engine is running, HTP is fed from the outer propellant tanks to supply the turbine. Due to the internal exhaust arrangement, the engine is a low noise version which has only a slight effect on the mass flow of the rear propulsive jet.

The pump therefore, together with the propellers are mounted ahead of the front air intake structure, while the fuel tanks are on the port side and the large control pump mounted on the front of the engine.

Control Location

Oil pump is under the fuselage, with a fuel cooled oil cooler on the starboard side. Majority of control valves and linkage systems are located on the port side but the HTP meter and air intake are on the opposite side.

The Spectre is an integral unit with out electrics and other attachment to the aircraft regimen little more than unhooking to the propellant tanks and locking of stators and throttle lever. Thrust acts on the center section of



CONTROL VALVES and linkage system are on port side for most part left. Photo shows nozzle of the engine right.





Vertol Demonstrates V-44 to Oil Industry

Petroleum industry representatives were recently shown Vought V-44(A) industrial capabilities in New York, including lifting and placing of heavy pipe, oilfield piping and tanks, prior to loading it on one of fifteen oil tankers. V-44s, now in production at Stratford, Conn., sell for \$294,000; 15-passenger variants of \$394,000 with deliveries in 60-90 days.

The main structures are not cooling bays but are for strengthening.

HTP is drawn from an pump through a feed pipe on top of the engine all to the combustion chamber and nozzle where it is used for cooling before flowing into the catalyst chamber.

Since the loss of HTP varies with throttle setting, the cooling system pivoted out of the most difficult development problems on the Spectre, which operates at 7,100RPM. It was solved by diversion of flow to particulate control areas during low-thrust operations.

Other problems already overcome include the elimination of catalyst-coke evolution by the Harbin Engine Co. engineers excluded development of a combustion chamber which would provide suitable mixing, although development of pump drives and gearboxes, and testing of HTP in its low pressure to prevent its mixing with oil, an especially difficult task in the pump.

Catalyst Chamber

Afier the gas is cooled, the HTP flows forward into the catalyst chamber where it is sprayed sheet of pads of refractory granules. These pads are an inert material, a fireproof plastic with many layers of needle holes and an air plate with means of large openings.

Decomposition by the solid silica catalyst into a mixture of superheated steam and oxygen, the HTP passes into the combustion chamber at 6,000RPM. Just downstream of the catalyst pads, less

time is required from a centrally located nozzle outward into the surrounding combustion chamber. That atomized spray spreads themselves.

Mixture ratio of HTP to kerosene at 4:1 is constant throughout the entire thrust range.

"By decomposing the paraffin prior to its injection into the combustion chamber," says Dr. Hirokura, "the smooth ignition of the fuel is obtained without the use of a spark or glow plug and as a consequence one of the benefits of a rocket engine that distinguishes it from a jet engine is that it can be started in flight and it lights up immediately thereafter."

At the low end of the Spectre thrust range, the engine after 100% thrust from the HTP alone. This provides an added safety factor since during start and shutdown, the gauge of strain chart out the combustion chamber, skipping my burned from an accumulation of heat.

Use of silver in the catalyst can be detected from the colorless exhaust of the rocket engine. At low thrust, there is a period before the nozzle and air throat is heated after ignition, an inherent feature of engines, showing the distinctive "shock" pattern of a hot supersonic jet stream and varying in length up to 30 ft.

Propellant combustion used in the Spectre has the advantage that combustion at other than the normal propellant ratio results in lower rather than

higher temperatures. Thus, the engine is running at its hottest when the mixture has a catalyst and are required mixing results in "cold" spots in the combustion chamber rather than "hot" spots.

The engine flew for the first time in December, 1958, at a Nitro powered Convair. The Spectre in this installation was removed off of the test mass bulkhead, with a large propellant tank carried on the boom bay.

Flight Test

First "hot" test of the Spectre in the air was made in January of this year and a flight test program is underway to evaluate handling and performance characteristics over a wide range of speeds and altitudes.

This program will be supplemented by a second Convair now being used

to carry a Spectre. Flight trials of the Spectre also are underway on a S.B. 13, which made its first flight on May 1.

Conclusion

The Harbin

choose hydrogen

as propellant for the Spectre over liquid oxygen and nitrous for a variety of reasons. Liquid oxygen, with a very low boiling point and rapid evaporation, was selected as favorable for use as an interceptor aircraft which requires constant altitude for long periods and also because of the difficulties in dealing with its extremely low temperature. Nitro and was discarded as unusable for a supersonic aircraft due to its high cost and low efficiency.

Despite the fact that it is expensive and requires special handling due to its mono-propellant characteristics, HTP was selected.

One of these was, in fact, considered an advantage. Since it contains energy of its own which can be released by a catalyst, HTP could be decomposed into steam and oxygen for driving a turbopump.

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First Whirlwind Mk. 7s Delivered

First batch of Westland Whirlwind Mk. 7 helicopters, first to be built in England specifically for oilsearching work, are being put up as warload at Yeovil after delivery to Royal Navy. Powered by Alvis Leonidas Major, it is Sikorsky built under license.



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Controlled by radio signals from ground through cable, Kansas City helicopter flies with no pilot. Control station is small, light and can be operated on ground or from mobile vehicle. Benthfield equipment, such as 8 TV cameras, can be selected remotely.

De Havilland turned this to advantage, just as it did the fact that HTP doesn't generate heat when it's high enough to ignite fuel which could be exposed to heat with the oxygen released.

Krebsow was convinced that the obvious choice for fuel was one that would already be available in a mass-produced aircraft.

"At the same time, no designer is immune if he wants fuel and fuel are heavier weight added outside the rocket engine's combustion chamber," said an official of the de Havilland Engine Co. "With the Spectra system, therefore, as fuel we have retained all the combining advantages of self-igniting fuels such as the German used in the ME 162 and the French still using as the Tarzan warplane. We have the certain risk of an incendiary fire or explosion if they accidentally leak."

Starting System

The fact that the pressure and temperature generated in just the combustion chamber can be harnessed to provide both an engine starting system and an auxiliary drive system means major auxiliary services can be provided without any secondary power supply.

Reduction of cooling problems as a result of the relatively low combustion temperature of the precombustion motor is cited as an advantage. In the case of the liquid oxygen rocket, de Havilland

saw, cooling is a major problem, so much so that in the need for lower temperatures fuel/oxygen mixtures far from the optimum are likely to be used, affecting the efficiency of the rocket.

"The oxygen must be oxygenate rate as well as produce a serviceable fuel with good plug and micro-switches, quit apart from a separate source of energy for the various auxiliary services," the company adds. "Furthermore, it is obvious that if one has a liquid at -184°C stored in an aircraft then suitable precautions must be taken to ensure that controls, valves, etc., do not freeze-up during a working period."

HTP Disadvantages

Through denser than liquid oxygen, HTP is not as dense as water. Both these characteristics share the advantage of being much cheaper than HTP. One of the largest disadvantages of HTP is the fact that it must be taken to prevent it from coming in contact with any of the many catalyst agents which will cause it to react.

De Havilland since 1948 has been advocating use of liquid propellant rocket engines as a means of providing maneuvered aircraft with a rapid rate of climb and quick acceleration to maximum speed, as well as maneuverability at various altitudes.

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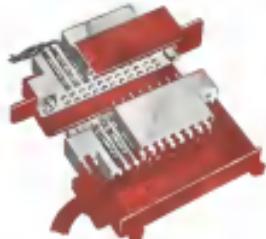
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design and development of a variable thrust aircraft rocket engine, de Havilland's main project in the field had been the Spectre assault take-off unit for the Comet 1. This was a self-contained unit using HTP as a mono-propellant, supplying it from a pressurized tank which was an integral part of the engine.

De Havilland's Supermarine, developed from the Spitfire, was an ATG and which used Lorraine with the HTP to estimate performance. Supermarine employed tanks pressurized with nitrogen to lance the propellants into the combustion chamber. It provided 4,000 lb thrust for 40 sec. Supermarine was to produce for the Vulcan Y-bomber booster, which consists two, mounted in accessible rear bays which are jettisoned after takeoff.

A constant thrust version of the Spectre has been developed for the same purpose and for guided missile powerplants. This and the variable thrust Spectre are located production.

The merits of the Spectre thus far have been disclosed by de Havilland D. Spe. 1, 3 and 5 variable thrust versions and D. Spe. 2 and 4 constant thrust units. Ministry of Supply contract for the constant thrust Spectre was received in 1955 and the first such unit test in 1957.

British Army Develops Anti-Tank Missile

London-British arms disclosed a new anti-tank guided missile with an accuracy which it says can be measured not in yards or even feet but in inches. Missiles, not yet in service, is guided visually onto the target with a remote apparatus resembling a combination of a steering wheel and a periscope. It was developed in Australia.

Improvements Slated For German Airports

Bonn-USAF has selected 512 sites for the biggest U.S. military dollar expenditure in Germany since the end of the war.

Ten USAF Air Force units will be sent to Germany to command the 10th AF Reconnaissance Wing, presently run 840 of Speargophones to 10,000 ft.

Promised low spending U.S. dollars for construction in Germany were established by agreement in May 1956 between the German Finance Ministry and the U.S. Since the end of the war major construction has been paid for with Deutsche Marka originating from occupation costs, German Support Detr. funds and Mutual Aid committee purse funds.

Work on the runway extension has

started and is slated to be completed in 90 days.

Other seven other airports in Europe are currently in the 10,000 ft category. Other stations west of the Rhine River are being considered for expansion. These large include those in North Africa at Ben Guerir (14,800 ft), Noumea (12,200 ft), and Wheeler, Trapani (11,000 ft). A fourth, at Lajes, in the Azores is 10,500 ft long.

A 17th Air Force spokesman said the greatest reason for the larger Speargophones runs is to handle more nuclear bombs including the B616, nuclear incendiary bombs, used by B-57s. An Armstrong Wright B-57 should be soon ready to plan proposed by Prudential Engineering in effect, the B-57's operating load factor, while its Speargophones could probably be lowered for part of the



XSM-64 Launching

Before version of North American Norden, the XSM-64 designated by company G-25, was driven by motor in long launched. This version was successfully fired at Patrick AFB. This before version still was too initially tall of X-10 test vehicle. Booster has two 150,000 lb thrust chambers developed by North American's Rocketdyne Division (AW Aug. 19, p. 29). Final version is designated SM-64A (AW Aug. 26 p. 35).

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Navy Mixes Two Generations

Navy's first piston engine fighter development, Grumman FTF Darront is shown in flight with its latest Grumman supersonic F11F1 Tiger. Supersonic F11F1, powered by Carrier Wright J35 turbojet is undergoing carrier evaluation.

Both Contracts procured under U.S. Grumman construction agreements are awarded directly to the Grumman Finance Division which in turn selects a contractor mutually agreeable to both governments.

U.S. Air Force control of West German airports has become an also-brief topic.

In a letter to Chancellor Konrad Adenauer, the chief executive officer of the State of Bonn has demanded that USAF has over its part of Frankfurt-Bebra Main Airport, West Germany's biggest, in the German

Massive President George August Zinn has refused the test of the letter he wrote to Adenauer using the federal objective to back up the airport move. He says he has not yet received a reply to date.

Adenauer, a leader of the majority Christian Democratic party, Zinn is a member of the Social Democrats, the country's chief opposition party.

Zinn's letter is seen as an election

campaign in the rigorously contested campaign. It is also part of a running battle between Frankfurt and Bonn for top spot among West Germany's rail airports.

With the West German influence behind Bonn and Cologne, now officially released from British control, the Frankfurt leaders are worried that an aerial airport will have an edge over a mixed civilian civilian one.

Federal Transport Minister Hans-Cheistoph Seehofer pushed hard these days to end this week when he said he believed in the civilian role of Frankfurt Airport will be the first in West Germany to handle trans-Atlantic jet passenger plane. He said he did not think Air Force bases would interfere with jet passenger planes because the Air Force has its own runway.

The civilian-controlled runway has been extended from 7,400 ft. to 9,440 ft. but the additional length will not be opened until September 1. Transport Ministry officials say that another 1,968 ft. can be added within three to four months in order to accommodate jet transports.

United Aircraft Plans 82,500 Engineer Prize

East Hartford, Conn.—To encourage technical advancement in all divisions of the United Aircraft Corp., a financial and \$11,500 prize will be awarded annually by the company for the outstanding engineering accomplishment in a corporate engineer.

Members of engineering staffs of United's five divisions, Pratt & Whitney, Sikorsky, and Hamilton Standard, as well as No. 100 and 101 groups—the electronics and avionics engineering arm, large as small, will be eligible.

An award will be presented after the late George J. Mather, head of the electronics and engineering branch of Pratt & Whitney can when it was founded in 1925. He designed Pratt & Whitney's first radial air-cooled engine, built which evolved the Wasp series.

880 Requires Special Camera for Templates

Huge template camera has been acquired by Convair San Diego Division of General Dynamics Corp., for work on its F-101B fighter.

Built by Robertshaw Photo Mechanics Inc., Chicago, camera is 30 ft. long, 5 ft. high and 7 ft. wide, weighs more than 10,000 lb. It will be able to reproduce templates ranging up to 80 x 3

12 ft. and within 1/200 in. Dimensions: Unit uses 43 ft. dia. of plates, a focused manually or electrically with out-of-focus electrical interfacing features.

AVIATION WEEK, September 3, 1959



SERVO MOTORS

Standard Kearfott servo motors and servo mechanisms are available in sizes suitable for aircraft, space, medical and aerospace. These new linear friction electric stepped position servos measure over 40 volts on input and 20 volts on position. Fixed phase excitation is rated at 10 watts in 26 volts 400 cps and at 10, 11, 13 and 16 watts 115 volts 60 cps.

SUMMARY OF CHARACTERISTICS

No.	Size	No. of Revs.	Max. Torque	Max. Current	Weight
10	10 in.	4,000	1/16	1.2	11 lb.
11	10 in.	4,000	1/16	1.2	11 lb.
12	10 in.	4,000	1/16	1.2	11 lb.
13	10 in.	4,000	1/16	1.2	11 lb.

TRANSISTORIZED AMPLIFIERS

A new transistorized servo amplifier suitable for driving war 9, 10, 11, and 15 rev/min motors is also available. This amplifier provides a 45 vdc, 4 watt output. Designed to meet the requirements of MIL-S-826B, it is rated for operation over the intended temperature range of -50°C to +70°C. No separate cooling is required. Dimensions: 2.14" x 1.92" x 1.02" height, weight 4.7 oz.

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TAKOFF run of the Saab Aviation Baroudeur is shown in the photo sequence above with USAF test pilot Maj. Arthur Murray at the controls. Max magazine disk for takeoff from grass field is 3,500 ft. with full 13,500 lb. gross. It is powered by 8,100 lb. thrust Atar 10R/10R4 turbojets.

Baroudeur Stresses Rough Field Capability



BAROUDEUR lands on grass field with ribbon type landing chocks extended and flaps just ready for touchdown. Note small flag near extended landing edge slats and ventral fin nose fairings.

Inset: Latest S.E. 3004 version of the French 300E4 fighter.

in NATO Race

Paro-Sud Aviation's latest version (S.E. 3004) of the Baroudeur does landing gear deployment and storage considerably faster than NATO's eight fighter competitors scheduled to be held in France late this month. The S.E. 3004 research has been flown by a variety of international test pilots including Maj. Gen. Albert Béral and Maj. Arthur Murray, USAF test pilots. It is powered by a Snecma Atar 10R/10R4 turbojet delivering over 8,600 lb thrust with a specific fuel consumption of 1.06 and engine weight of 2,200 lb.

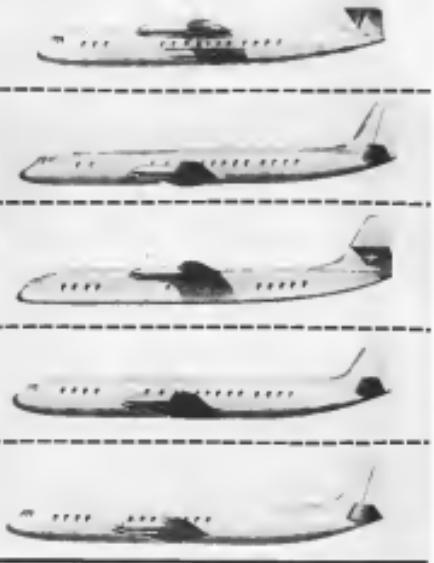
The S.E. 3004 generates 13,500 lb for takeoff and around 550 lb/ft of jet thrust. It can fly at Mach .87 at 30,000 ft and has a top speed of 610 lb/min. At full combat load it can take off from contaminated grass or dirt fields in 5,500 ft and land on grass chocks at similar terrain within 1,800 ft after touchdown. It carries a variable armament including two 30 millimeter cannons, two 30 lb high explosive or weapon bombs or two multi-cluster rocket launching pods. Baroudeur landing chocks are made of magnesium and will especially need them since they are easily deployed. Braking during the landing is assisted from arrestor cable blocks controlled by the pilot and designed into the rear portion of the chocks and a ribbon type parachute. Latest version of the Baroudeur also uses two ventral fins to achieve greater stability and leading edge wing slats. Designer of the Baroudeur is W. F. Jakobson, who is now sales manager for Saab Aviation's Consorcio pt. Import.



BAROUDEUR (top) comes to rest after short landing run of about 1,180 ft. Ground mobile fuel fighter is paraded by special trailer (bottom) into which the aircraft can be winched for transport and servicing.



Vickers Tooling to Produce Vanguards



SOOTY project studies were made for the Vanguard with three live-in facilities. High wing design, with disadvantages of gear storage problems, were filled by Trans Canada Airlines application based on very steep climbing characteristics. TCA also claimed that with high wing airplane pilot would not be able to see whether new lead bars except clear from wings, an important consideration in Canada.

CODRIT meeting of Vanguard at first British Airways airplane 1956, first for flight crew members a cable in foreground

Weybridge, England—One of the longest tooling programs ever undertaken for a European-built aircraft is well under way at Vickers-Armstrong (Aircraft) Ltd. for the transpacific Vanguard aircraft.

Vickers estimates the total market requirement for the Vanguard at about 215 aircraft and is tooling up for four-aircraft production. Initial production will be at a three-aircraft rate in 1960.

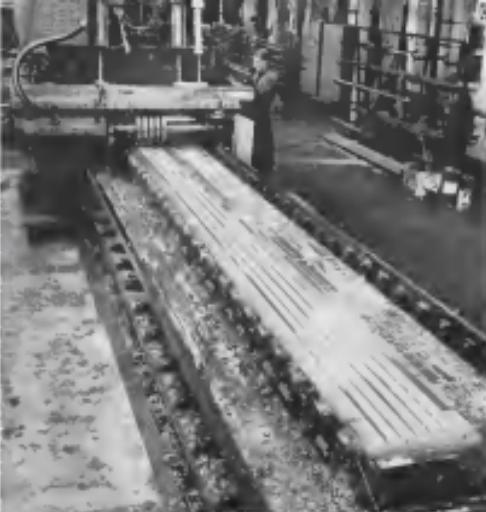
British European Airways' Trans Canada Airlines has ordered 20 aircraft of the long-hauler, which are powered by four Rolls Royce Tyne engines. First BEA aircraft is scheduled for delivery in the spring of 1960 and TCA will get its first Vanguard in the fall of that year. Next customer on line is being offered 1961 delivery.

No Prototype

There will be no prototype. The first aircraft is being built on production jigs and already is taking shape. Flight assembly is to be completed in December, with wing cutting scheduled immediately thereafter. First flight is set for September of next year.

Production planning for the 76-128 passenger Vanguard presented an entirely different set of problems to Vickers than did the smaller Viscount, on which soils are very approaching the 400 mark. But the firm was able to draw on big-aircraft experience gained in building the Viscount family.

The 410-seat Vanguard, in fact, is being planned into the same building of Weybridge which turned out the Viscount, on which production is now under way. Many of the 400 of hours used in work on the Viscount's wing program at one point and the results of their labor can be seen in the huge jigs now going up on the massive floor at Vickers' jiggery coopers down.



STRIPS for Vanguard's wing paneling rolled on a Gossel 450-type rolling machine. Total of marker is 45 ft long and 3 ft wide. Gossel-type rolling center are of adjustable mounted tools type.

With a fuselage length of 322.8 ft and a wingspan of 115 ft, the double-bubble Vanguard will be one of the largest aircraft in the air. This is reflected in the 10 ft high center fuselage jigs at Weybridge.

Fuselage assembly of the Vanguard takes the following steps:

- Construction of five intermediate-coupler sections, forward fuselage section, wing center section, aft fuselage section, and tail cone.

- Coupler panel to the forward fuselage section and the tail cone to the aft fuselage section.

- Union of these three major subassemblies to form the completed fuselage, in event that doesn't occur until almost two-thirds of the way down the assembly line. Two jigs are added here. These jigs hold both the fuselage and wings to be carried to an inverted stage below jiggery.

The method of construction is markedly different from that of the Viscount, where the fuselage is assembled in one jig.

Major assemblies of the fuselage are located open in a manner enabling contractors to be as much as possible

PRODUCTION

from the skin box records. The cockpit section and center section are exceptions to this but here a profile control is used at the jig extremes to assure even matching with the other sections.

A 280-ton Hydrel stretch press is used to stretch Vanguard fuselage panels and smaller Hydraulics for the frame sections. Fuselage is built up from panels which are joined by rivets. Skin is built around in strakes.

Length of the strakes are the forward and aft fuselage sections. Each of these is built as two halves, with top and bottom panels being added at the second stage of assembly to form the completed fuselage section.

Half Sections

Each of the "half fuselages," as Vickers calls them, is built from 16 of the pre-assembled panels. Frame in most cases stand on top of the fuselage and are clamped to the skin with rivets instead of the frame. Chants, rather than the frame, are cut out at the strakes. There is about a 20-in. pitch between frames and 45 in. between strakes.

Windows, which are 16 in. a. 26 in. elliptical shape as in Viscount, are set at a base 39 in. pitch. There are close-pitched vertical strakes between the windows and the last complete strake running past the windows both top and bottom has a fulcrum



TOP HALF of Vanguard fuselage assembly is put together on jig. Codrill assembly is exception to most of Vanguard fuselage construction due to need to knock it possible from skin box toward



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which picks up these verticals.

For stability there is a "tephit" integral carbon around each window with a hipline which picks up on the forces elongate the windows. As though there were separate clamps at all other places had stronger punchouts, there is a continuous clasp at the window rigging.

There is double bracing around the door area and, at some points, triplets with the front deck and two doubles.

The front mandrel provides the base between the upper and lower bulkheads of the double fuselage.

The tail cone is built as a single unit while the cockpit is built in two halves split at the floor level. The instrument box is an encapsulated box at the nose section.

This differs from the Vanguards in which the whole underside of the nose section is built as one. Upper curved areas in the Vanguards, in addition to the nosewheel fairings are the nose radome and the tail cone.

Cradle Section

The fuselage center section where the wing joins the fuselage is built around a wing liaison box which is built into the wing liaison bay. This is long enough to fit the rear frame. Although the wing liaison box itself is pre-assembled, this section of the fuselage is built as a complete assembly with no pre-stressing.

Three main fairings which carry the shear webs are fitted to the point where the load drops off and then in turn to the fabricated assemblies of other frames. There is more extensive cladding here than in the fine and aft fuselage sections.

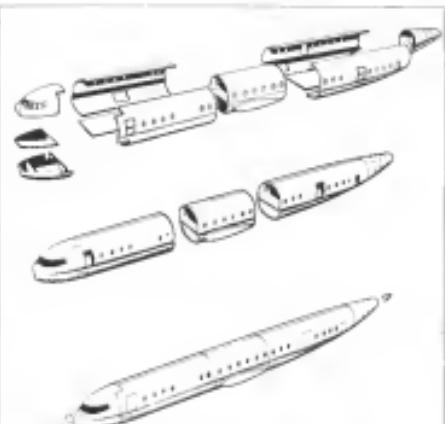
A torque box stiffener goes in, coming below the flooring and the studs from the shear webs extend outside the fuselage slightly to pick up the wing structure.

A cushion passes across into the liaison box through the forward web and from there to integral tanks in the wing. Scatter fairing and cladding goes under the liaison box.

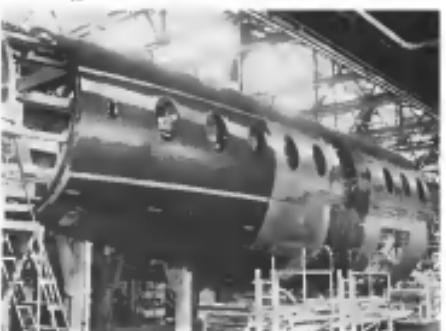
There is an electrical bus forward of the box and a hydraulic bus aft. Access to these is through cutouts in the bottom of the fuselage. The hydraulic bay is a self-contained compartment which is pressurized at a slightly lower pressure than the 6.5 psi reading maximum of the cabin. By pressurizing the hydraulic explosive slightly to 10 psi, a bleed is provided from the hot water system when pressurization begins.

The thin skin over which form the liaison liaison box runs throughout the wing. Integral construction is used for both top and bottom surfaces of the wing liaison box, with leading and trailing edges and tips being added after the box is joined to the fuselage. The flaps from the Vultee prototype

AIRPORT WEEK, September 2, 1972



FUSELAGE ASSEMBLY whole and half sections in down (above). One of partly completed half bodies on jig is shown below.



in which the wing is assembled on a

through removable panels in the leading and trailing edges.

The two isolated integral tanks of the Vanguards carry 2,220 U.S. gallons each and the two outer tanks 880 U.S. gallons each.

Altogether, there are 58 panels of

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varying shapes used in the construction of a Vanguard wing from top to bottom. These are radii from straight leading panels which run from 12 to 29 ft in length, from 27 to 50 in. in width, and from 38 to 7 in. in thickness. Upper panels are DTD 5020 and lower panels 24874.

The panels are first surfaced in a Cessna machine designed for the job. The surfaces then are sanded out on an Oshkosh A-96 four-surface smoother which has a table 9 ft in length and 5 ft wide. Carbide-tipped sanding cutters are of the adjustable mounted tooth type.

Edge profiling is done in a Cessna profiling machine which has a table 42 ft by 2 ft.

After profiling the skins are carved by lathe forming and slot preening. The forming is done on a Vickers-designed machine built by Albatross Ltd. The slot preening is done on a Vickers machine which runs 1011 in diameter and slot slot. Rate of feed through the slot produces the desired degree of curvature.

In construction of the wing, the three panels are built up separately, and then the assembly box is attached in the main wing frame.

Since the wings are cantilevered, they will be panned. It is therefore planned to paint the outer aerofoil and as experimental paint jobs now being applied to a Vickers in anticipation of this Vanguard requirement.

In view of the original configuration employed in the wing, it is interesting to note that the Vanguard must also be built a high wing aircraft. It was designed originally to specification laid down in 1953 by British European Airways and BEA favored a high wing as a result of its favorable experience with Elstamflite.

High Wing Studies

"An enormous amount of work was done on high-wing designs," Vickers spokesman said. "Not only was the airplane shown on paper, but preliminary weight and stress calculations were made and performance and costing worked for each study. Some very interesting high-wing variants were evolved."

Toon Canada, which entered the picture at this time, put forth some strong arguments against the high wing, however.

TCA insisted that a high wing would not be acceptable in the U.S. and Canadian market, that it presented many servicing problems, increased climbing rate, and made it impossible for the pilot to see from the cockpit whether the wings were free of snow—an important point to Toon Canada.

So the low-wing design was adopted. Consideration also was given to making

the Vanguard a pure jet but tailoring engines was then given. Weight considerations eliminated the double bubble fuselage, with two large baggage holds below the passenger deck.

From a standard field of five designs, the choice was made in April, 1953, at the aircraft which is being built today at Westbridge. BEA placed an order for 20 in. 1956 and this was followed in January of this year by a TCA order for 16 with an option for four more.

TCA and it placed its order only after an "extensive analysis" of all types of American and British aircraft on order for the 1950s.

According to Vickers, the stage I-Tyne will be available in 1959 to provide a Vanguard cruising speed of 410 mph. Stage II-Tyne (1960) is to give 421 mph while stage III-Tyne (1963) will have a corresponding cruising speed of 460 mph.

Ventus Configurations

Vickers offers the Vanguard in a 27-passenger first class configuration, 36-passenger mixed version, 91-passenger tourist layout, and 125-passenger coach configuration.

Aircraft is designed for range up to 3,800 miles at 410 mph and maximum weight 41,000 lb. Fuel capacity is 24,000 lb.

Vickers notes that approximately two-thirds of the Vanguard's payload can be carried in the baggage holds, providing freighter operation without modification of the passenger cabin.

The two holds provide a total volume of 1,410 cu. ft. The forward one has a 25 ft length and the rear one, 22 ft 5 in. Both have an interior height of 4 ft 8 in. Loading doors are 5 ft 6 in by 3 ft 10 in. The doors are manually sprung "cladidors" with the two halves interlocking.

Load limit is truck bed height.

Studios have made of an all-bleeding version of the Vanguard which would have a 7,110 lb. dry weight for 90,000 lb. of cargo carried in three configurations: the main cabin and the two lower holds. In this aircraft, the rear passenger door would be replaced by a large freight door measuring 5 ft 10 in by 9 ft wide. Vickers estimates the Vanguard freighter would achieve operating costs of 1.9 to 3.5 cents per pound.

There are four main doors on the passenger cabin of the Vanguard—the entrance doors located low and off the side aisle, each fitted with folding steps, and two emergency exit doors on the right hand side which double as service entrances to the galley. In addition, there is a third emergency exit door on the left side at the rear of the fuselage.

Two cabin window emergency exits are placed on each side near the wing and fuselage next to the main pin

engine exhaust doors and also some emergency exits.

Accommodation is provided in the Vanguard for eight crew in the cockpit, the three crew in the rear of and between the pilot, passenger seems to engine, propeller, landing gear, flap and trimmings controls situated on the central pedestal.

Conventional flying controls are manually operated in push-pull control rods. For pitch control surfaces can be locked mechanically from a lever on the control pedestal. A resistor has connected to this lever does not prevent sufficient power for take-off with the back stick, although it allows power for testing.

Flaps are Fowler type fitted in four sections per side and connected by bags which move on rollers as steel cable fails. They are hydraulically.

The Vanguard's two-fold landing gear has twin wheels on both nose and main gear. Since the gear retracts forward, there is a fair fall clearance, lowering weight. Main gear retracts into the inner engine nacelle.

The Tyne engine drive, four-bladed de Havilland propeller is in constant control. The front propeller is solid.

Post-Ventus aircraft will be fitted for extensive flight testing but the cross-pole plan attachment as yet is. After flight of the initial aircraft as September last 1956, the second aircraft will come off the assembly line in November/December. This will be followed by five more at about three month intervals during 1959 and certification test will be carried out all through that year. BEA then will take delivery of its first aircraft early in 1960, with Trans Canada receiving its first Vanguard in the early autumn of the same year.

PRODUCTION BRIEFING

American Aerophane Corp., El Segundo, Calif., added a Fokker Dr.

The new division plans to produce Fokker-designed plastic laminates for jet plane radar reflector panels, aircraft wing and fuselage skin, tail cone, radome fins and control surfaces, radomes, air intake doors and control surfaces. Prototypes will be adapted to high temperature.

Armetec Mfg. Corp., Mobiletown, Ohio, and a 544-800 General sign calling machine has been installed as part of the new equipment needed for aircraft electroplating.

Among present and contemplated programs are parts for the KC-135 tanker, 707 commercial airliner and improved B-52G, all for Boeing Aircraft Corp. The part mill will take 60 ft. long poles and can eventually be converted from template casting to manual casting by tape

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The SAF-T-MATIC harness consists of Pacific's "Fast-Strap" Shoulder Harness Belt with integral shoulder straps and a specially designed plunger belt set that holds the harness firmly in place. The harness is a single, complete system that provides ultimate passive safety.

The SAF-T-MATIC Harness is a unique new aerospace system especially suited for commercial and private aircraft installations. For the first time both shoulder and waist harness are joined into a single, complete system that provides ultimate passive safety.

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Also, at last, is a complete system which includes all components—full motion harness, full motion shoulder and waist harness, plus a quick release buckle.

For further information, call or write Pacific Scientific Company, P.O. Box 22000, Los Angeles 21, Calif. San Francisco / Seattle / Atlanta, Texas / New York / Canada—Gardett/Mfg. Corp.

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MATS Tests 4-D Navigation in Pacific

By Russell Hawks

Hickam AFB, Hawaii—Four Democratic Optimum Flight Planning Navigation is getting minor reaction from Military Air Transport Service, only carrier which has used it operationally. The highly refined pressure pattern navigation technique can extend range of east coast experiments by 15% or more in many cases.

Air crews and meteorologists at the Pacific Division of MATS are generally in favor of the optimum technique. Hickam is far enough westward to have never approached 35% in the Pacific but is still thought to add up costs over a period of months to a significant savings. Other benefits have been an apparent improvement in accuracy and consistency of forecasts, and better time work between operations and weather people.

But a question nonetheless asked is whether the benefits are great enough to worth the expenditure of extra man-hours in preparing 4-D analyses and optimum flight paths.

ARDC Concern

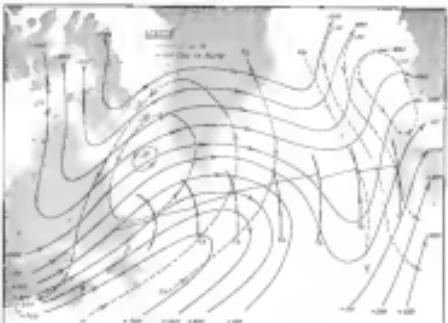
The technique was developed by Cook Research Laboratories of Chicago under a contract awarded by Air Research and Development Command. A modification for Strategic Air Command is now being developed.

The first dimensional analysis, in its most selective, represents large scale atmospheric pressure variations on aircraft in latitude, longitude, altitude and time. Wind can be derived for any point on the aircraft in relation to the known relationship between wind field pattern and pressure pattern. The technique has been used several times in the future can be figured by linear interpolation between the current and the current analysis.

Optimum flight planning uses the four-dimensional analysis, a special board computer and a simple technique to draw from pressure data the minimum fuel track. The use of digital computers, improved long range communications and teams in warmer weather predictions will increase effectiveness.

The 4-D technique technique is expected to reduce fuel consumption by about 15% because of the added importance of fuel economy in their operations. Several dimensional analyses with long overwater routes and jet transports en route have sent representatives to the MATS Optimum Flight Planning School here to study the technique for possible adoption.

The accuracy of any pressure pattern



OPTIMUM flight planning used on Atlantic flight. Chart shows indirect bending between two points on a flight from Goose Bay to Fairbank.

analysis method decreases in less latitude and within 20 deg of the equator is so slight as to make the method useless. Air Force Climatic Research Center is currently seeking a way of fitting the linear latitudes into the 4-D optimum flight planning technique.

MATS Pacific Division makes much out what is probably the most unfavorable area yet to be flown operationally using the optimum technique. Routine of these routes at Hickam, located about precisely at 20 deg north latitude. The great expense of fuel in the cost of operating planes in the northern climes and the effects of pressure gradients during the winter months all contribute to the difficulty of operating an optimum in winter, when pressure gradients and hence winds are strong, the prevail somewhat greater. The division would like to go directly from Tokyo to Hickam, skipping the usual fuel stop at Midway. This would produce a considerable saving in money and expense. According to the last Weather Briefing, the flight could be made in summer and possible in winter with the use of optimum flight planning.

Experience also shows that the optimum track often lets you close to the great circle track or the direct line track on Pacific routes. To save man hours, the division has adopted a modified method using six selected tracks between Hickam and the MATS

West Coast bases at Travis AFB, and 13 selected tracks between Hickam and Tokyo. On the basis of each navigation analysis, an optimum track is plotted for each route and all flights are directed along the closest selected track until the next possible optimum analysis is released.

An hour and 20 minutes is required to make an optimum flight plan while only 20 to 25 minutes is required to make a selected track flight plan. The selected track plan are pre-potted and the problem is largely reduced to one of card reading. Since the track selection is random, it is difficult to assess the advantages of optimum routes. MATS is working on methods of plotting such at making pure optimum more economical in time.

Weather Data

Meteorologists feel that the pay-off in savings in fuel expense could be substantially raised if the number of weather measurements flights over the ocean were doubled. This would increase the density of reporting points contributing to analysis and thereby improve the accuracy of forecasts. The purpose of the technique is to get the best possible use out of available weather data no matter how limited. But forecast accuracy is now less than the potential precision of the optimum flight planning method on which the 15% figure is based. This being true, forecast accuracy is an important limit-

ing factor on the airspeeds to be used from the aerobics. If it is expected it might pitch a plane to port or starboard even without autorotative improvements.

Rigid air traffic clearance and the difficulty of radio communications over the long distances involved tend to prevent crews from gauging the most cost effective course. Visibility is one of the chief characteristics. Design for use in areas where weather permitting will probably never be as complete as it is in the United States, it makes available to the navigator methods of night navigation on which to base flight plan amendments.



Redstone Airlifted

Airway's Redstone missile, produced by the Chrysler Corp. near Detroit, is loaded aboard a USAF Douglas C-124 Globemaster for transport to test site at Patrick AFB. The USAF Army and Chrysler transportation specialists responsive planning of padded missile transport and the taking down for the trip



ability to make full use of the information gained by re-analysis risks omission of some of its advantages. Future characterizes flight in a 3D mode would correlate and eliminate any opposition to "play the numbers."

CRC MATS pilots have suggested that up-to-date wind shear data, along with flight time, if well used, can be a major factor in safety. The author's opinion is that aircraft characteristics, design factors in areas where weather permitting will probably never be as complete as it is in the United States, it makes available to the navigator methods of night navigation on which to base flight plan amendments.

Contour Map

The 3D analysis is a contour map showing the variation in true height of a certain value of barometric pressure at pressure altitude. If the wind and temperature, either of them, change, there is a normal height. Therefore a pressure can be identified in terms of its normal height. This is pressure altitude.

The basic term in the analysis is D value, the difference in feet between the pressure altitude at which the analysis is being made and the true value of true altitude at a point on the map.

Essentially, it is the ultimate correction needed to derive true altitude from pressure altitude.

The advantage of using D value rather than millibars, the conventional meteorological unit of pressure, or feet altitude is given pressure level, D values are much more kept ready for ease of computation and it is a relative term easily modified by other altitude parameters.

If the true altitude of a point is higher than its pressure altitude, then a plus D value is recorded. For instance, if pressure altitude at a point is 10,000 ft and true altitude is 10,400

feet, the contour map is not always recognized by the crew.

Meteorologists and navigation agencies of the more objective and more useful weather representation is the 3D analysis. The former method of pressure altitude, either of them, changes or a meteorologist to split the different subregions, to make data applicable to a specific zone and altitude. Since 3D analysis is somewhat more subjective than former methods, it produces a better current in the hands of experienced meteorologists. Subjective methods are required only by experience.

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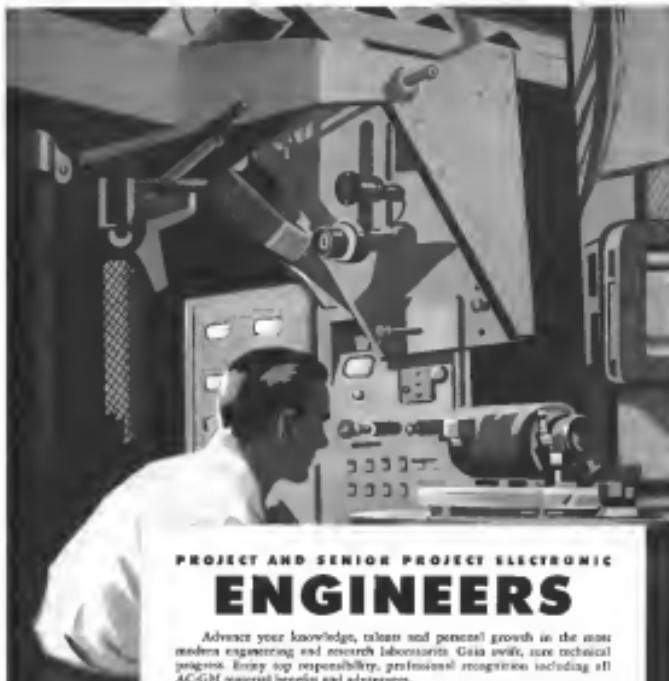
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If, L_1 value is +400 ft true altitude is lower than pressure altitude at a point than a minus D value is recorded. When conditions are standard and uncorrected pressure altitude is the same as true altitude, D is zero.

On the 4D analysis chart, lines of equal Δ value analogous to constant λ are drawn and each line is separated from the next by an absolute difference in Δ value such as 200.0. The horizontal distance α is ratio between the contour lines divided by the vertical difference in Δ value between those two positions. The ratio at which parameter α and β along a horizontal scale at the moment the analysis is made. The steepness of this gradient indicates the intensity of the greatest variation.

In the absence of a dense network of stations reporting actual winds a theoretical approximation is needed to convert pressure distributions to winds. This approximation is based on the geostrophic assumption that winds and flow parallel in the pressure level from time have and with high pressure to the right and low to left at a speed directly proportional to the spacing between the bars.

The sloping lines linked the wind as the pressure gradient force at levels 100 to 500 mb to fall down the gradient in latitude 40°N and 50°N. In geostrophic flow, the direction of the wind is set across the contour lines as might be expected, but parallel to them because Coriolis force effects are too small to affect the angle in the northern hemisphere and to the left in the southern hemisphere, opposing the pressure gradient force. When the strength of the air mass is great enough to generate Coriolis force equal to pressure gradient force, the resultant direction of flow will be parallel to the motion lines.

Karen Koen

There is a known measure of error in the geostrophic approximation because of the influence of surface friction and unbalanced forces in certain flows; however, the error is of the same order of magnitude as the probable error in the calculation of the pressure distribution over which the wind calculation is based.

If pressure systems never shifted or changed and if the flight were made at a constant altitude, the pressure altitude of the balloon, the gross weight approximation, and the D analysis would make possible good pressure pattern flight plans. Since they move and change conditions and since flights must often be made at elevations other than that at

names would graduate type pieces to him.

Variation of D with time and altitude for change of D with time and altitude triples of Ten and increase at the per hour. Each hour's flight is based on a forecast for the appropriate triple.

5 Volum

The analysis is translated to other altitudes by means of the S value which is the D change in feet per thousand feet of pressure altitude. 3 stands for specific temperature analysis and means the variation of temperature of a pressure altitude from the temperature at that altitude in the standard atmosphere. The thickness of a layer of air with a given mass pressure altitude is dependent on its mean temperature, therefore the D value at a given pressure altitude surface in the layer can be calculated from the temperature analysis, and the known S value at the

The tool for Equring 5 value is a graph known as a Postagram which gets



Moon Radar to Track Satellites

Dura-Moon Radio Antenna presently is being used to facilitate Minuteman equipment in preparation for tracking of the north satellite to be launched in cooperation with the International Geophysical Year. Dura's development of the Army Signal Engineering Laboratories at Fort Monmouth, which is known as a center of major policy development,

Altitude vs. Speed. Temperature Anomaly. The S value is divided by the point of departure to obtain the time interval between the temperature rise point and the intercept on the speed axis. If the temperature is above standard for that pressure altitude, the sign of the S value is plus if it is below standard the sign is minus. The S value is multiplied by the number of thousands of feet between sea level and flight altitude and added to the D value at the altitude level if flight altitude is higher and subtracted if flight altitude is lower.

In MATS Pacific Division, the use of S has been abandoned in the early part of the procedure when it is assumed that an S value above minus 100 is not often worth plotting, especially since most of the division's flights are within 2,000 ft of the regular 700 milbar (19,800 ft) pressure altitude limit. The D change in the distance is not statistically significant. The S value is now used commonly and for all flight research. In this case it is based upon observation made especially after the plan of the air force was adopted.

An approach has been had out on a 4-D analysis chart by combining hourly time slices between departure and destination and then plotting hourly headings. The first time slice is constructed by plotting the points which would be reached on hour's flight on a number of possible headings and drawing a line between them. This

is the true front. A bit shorter distance in order between the point of departure and any point on the true front is equal to ground speed since the time of flight is one hour. Successive time fronts all the way to the destination are laid out by finding the points reached after an hour's flight an hour perpendicular to the last front and joining them in the next front.

The hourly time fronts could be constructed by figuring a great many points which be cause of the gearing ratio for time and then averaging the points obtained with which to plot the points for the construction of each time front. Obviously, the more segments for that would be preferable.

Plastic Computer

Cook Research has created a translucent plastic computer which can be used to do this without estimating numbers or drawing other diagrams based upon the percentage relationship between pressure gradient and distance. The computer is based upon the same principle as the previous diagram excepting a reference line perpendicular to the heading and constant component from the gradient along a reference line to the heading. The lines are drawn in the opposite of the form of a cross and are the same arbitrary length because the change in D value does not end of a reference line to the other is the basis for selection of one of the wind conditions and drawing a line between them. The

points, D/D value falls from the right end to the left end of the intend line and are point on the true front line will be a constant and its strength will depend on the amount of the drop. If D/D falls from left to right there will be a headwind.

If D value falls down from you to front along the heading line, the crosswind component will be down left to right. The reverse will be true if D/D falls from front to rear.

Since the duration of flight can be found before the task is started with the computer, the time of flight can be established 15 or 20 minutes before the flight plus complete. The task is then down back to start time estimation to determine the heading from the last time front to the destination should be perpendicular to the front to give the minimum task. The computer is then used to figure the drift or tasks take to accomplish that heading in the fractions of an hour required to reach destination. A point is marked on the chart upon completion of the task and the heading is determined. The heading line is drawn between the two points and the last front. Since the two points is the point of departure from the last front to destination. A line between that point and the destination is the forward trail track. Track heading and drift lines form the familiar wind triangle though though wind values as such we used.

The point of departure from the last time front now becomes the destination on the right from the preceding time front. The process is repeated for each hourly time slice all the way back to the original departure point. It will automatically provide the optimum balance between the best wind conditions and extra distance flown to obtain them.

WHAT'S NEW

Reports Available

The following reports were sponsored by the Office of Technical Services, United States Department of Commerce, Washington 25, D. C.

The Properties and Properties of Some Fluorine-Containing Densins.—In F. O'Brien and others, Wright Air Development Center, \$1.00, 39pp (PB 121581). Nonmetallic Forming Metal Materials—Custodial Executive Computer for Wright Air Development Center.

For—Then Film. \$5.00, 18pp (PB 121582).

Part II—Tensile, High-Temperature Tensile Test. \$7.75, 20pp (PB 121584).

Part I—Tensile, Single Crystals. \$7.75, 25pp (PB 121583).

Part II—NIO-PtO₂ System.

\$7.75, 25pp (PB 121586). Part I—Ferrite Debris Loss. \$2.50, 9pp (PB 121588).

Crack Propagation in the Hydrogen-Induced brittle fracture of Steel.—In W. J. Bennett and A. R. Friman, Case Institute of Technology for Wright Air Development Center, \$1.00, 38pp (PB 121591).

The Relation of Heat Treatment to the Dynamic Properties of Some Carbon Steels.—In E. C. Smith, Naval Research Laboratory, \$3.00, 37pp (PB 121594).

A Program of Human Engineering Research on the Design of Aircraft Instrument Displays and Controls.—In A. C. Wilhams Jr. and M. Adelstein, Hughes Aircraft Co. and M. L. Rutledge, University of Illinois, for Wright Air Development Center, \$1.00, 39pp (PB 121595).

Effect of Glare on Control Operation Time.—In J. V. Bradley, Wright Air Development Center, \$1.00, 19pp (PB 121596).

The Ability of Untrained Observers to Match Visual Form Data for Highly Deformable Contours.—In J. Denz, the Johns Hopkins University for Wright Air Development Center, \$1.00, 18pp (PB 121597).

Predictions for Including Human Factors in the Development of the Workload Setpoint.—In R. F. Van Cut and W. A. Hines, American Institute for Research for Wright Air Development Center, \$1.00, 18pp (PB 121598).

Reliability Design Handbook.—In the Navy Electronics Laboratory, \$5.00, (PB 121599).

Symposium on Preservation for Modification Requirements.—In U. S. Naval Civil Engineering Research and Development Laboratory, \$5.00, 57pp (PB 119007).

Electron Transport Properties of Dilute Heavy Metallurgy Alloys.—In F. W. Koenig, Naval Research Laboratory, \$1.00, 19pp (PB 121581).

A Direct Measurement Technique of Determining Rocket Exhaust Velocities.—In L. E. Bellinger and R. Edou, the Ohio State University Research Foundation for Wright Air Development Center, \$1.00, 19pp (PB 121587).

Compressive Fatigue Damage of Aircraft Structural Materials.—Part I—2024 and 7075 Aluminum Alloy. Additional Data and Evaluation. A. M. Burdick and R. A. Heller, Columbia University for

Wright Air Development Center, \$1.75, 27pp (PB 121599).

The Properties of Conventional Metals as a Function of Temperature and Strain Rate in Torsion.—In E. P. Kerr and others, Stevens University for Wright Air Development Center, \$1.00, 26pp (PB 121592).

Classification of Shales and Related Reactions.—In C. C. Darshler and J. M. Borner, Petroleum Institute of Technology for Wright Air Development Center, \$1.00, 37pp (PB 121593).

Development of a Micro Method for the Determination of Aliphatic Aldehydes.—In E. W. Melberg and R. Wenzel, the Ohio State University Research Foundation for Wright Air Development Center, \$1.00, 35pp (PB 121598).

The Cylindrical Heat of Fusion of Ammonium Nitrate.—In A. C. Krasow, the Naval Institute of Technology, for Air Force Office of Scientific Research, \$1.00, 14pp (PB 121552).

Survey of Fundamental Knowledge of Mechanism of Action of Plasma-Es Engaging Agents.—In R. Freedman and J. B. Levy, Aerospace Research Laboratory for Wright Air Development Center, \$2.50, 10pp (PB 121553).

Liquid and Resinous Feasibility Study on Radiation Neutralization of Foods.—In R. J. Hilt, North American Aviation Inc., for Consumer Food and Cosmetic Testate Institute for the Armed Forces, \$1.75, 65pp (PB 121585).

The following reports were sponsored by the Office of Technical Services, United States Department of Commerce, Washington 25, D. C.:

A Preview of the Air Force Materials Research and Development Program.—In H. T. Harlan and R. F. Walker, Wright Air Development Center, U. S. Air Force, \$2.50, 49pp (PB 119145) (2). This publication is supplementary to those other volumes.

Air Force Research Material from July 1, 1954 to June 30, 1955. \$1.50 (PB 121611).

Air Force Research Material from July 1, 1953 to June 30, 1955. \$1.75 (PB 121610).

Vapor Deposited Coating.—Final Report.—In E. M. Schleser, H. S. Spiegel and J. W. Wolf, Massachusetts Institute of Technology for Directorate of Research and Evaluation, A. M. Burdick and R. A. Heller, Columbia University for

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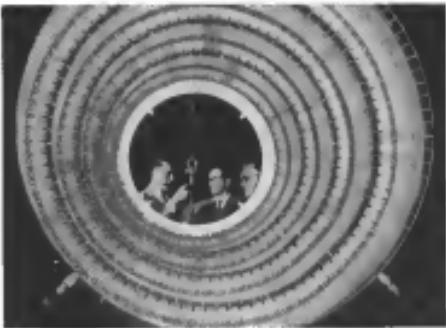
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Heater Tests Nose Cones

Nose cone of Army's B-57B missile is tested in this forced-velocity bath made up of banks of more than 1,000 quartz infrared lamps capable of simulating heat of reentry. Hydrogen-pulse membrane allows a variety of heating rates during heating tests, which run approximately 30 sec. 3,600,000 watts of electricity are required for a test. Heater at Chester plant and Detroit where Reliance is manufactured.

EQUIPMENT



ARTHITIS: concept of Klein Field installation shows how role of jet car could launch a plume (jet) and criteria for additional analysis. Speed of unguided car is remotely controlled from the small shark at the foreground.

Carrier Deck Gear Development Pushed

By George L. Christian

Lakehurst, N.J.—Future of mass-based station brings up parking development of launching and recovery systems steadily ahead of development of the growing stable of high performance aircraft being designed, built and qualified for fleet operation.

This premise, which already has resulted in development of an interest combustion catapult not dependent on a nuclear reactor's output, is sparing the Navy into investing \$155 million in a new launching and recovery system last fall. The date, though, is still unclear. To date, about \$23 million is already under contract.

Called Naval Air Test Facility (Naval Test Station), the center is being built down out of a 4,500 acre scrub prairie at the Lukahen Naval Air Station, Larson Industrial, as the Navy's lighter-than-air headquarters.

Russia for building such comprehensive facilities for NAEF is to assign

that, at once, increasingly but less and less places move over and into the best, easiest-to-handle and strongest gear will be capable of handling them. If enough of an existing gear are inadequate or become expensive, then \$300-million ships as the Ford-class, Saratoga, Ranger and the proposed atom-powered CVAN (Carrier Attack, Nuclear) become more interesting because of their inability to make their jet plane striking more economical.

HATT's Dual Mission

Capt. R. M. Tammell, BuAer Project Officer of the facility, told *Aerospace* that the mission of NAFTE is to evaluate aircraft launching and recovery equipment and related components. He will take all such gear and test and evaluate it to determine whether it is suitable for a given class of carrier before the equipment is committed to a ship. A catapult is such an integral part of a carrier that it becomes a major

operations be reviewed at should it be un-

"Second part of our mission is to support the development of launching and recovery systems by providing facilities and services to contractors and government agencies engaged in development programs in this field," he said. "Contractors will have here a facility where they can conduct, with their own people if they desire, large scale and diversified tests on their development programs."

Some of the more important problems the industry will tackle:

- **Launch.** Feasibility of highest launching and recovery speeds to prevent designers a fixed load in developing very high performance aircraft will be investigated. Faster take off and landing speeds will impose greater G loads on pilot, plane and equipment and the Navy wants to find what the practical limits of these factors are. One test especially requires a series of short TGs on the pilot during the best launch landing arriving loads are about 1.14Gs.

If it is found that higher launching Gs will consistently knock out pilots, a requirement may be created for a device which will automatically take the plane off from the cameraman and control it for several seconds of initial flight to allow the pilot to recover sufficiently to handle the controls.

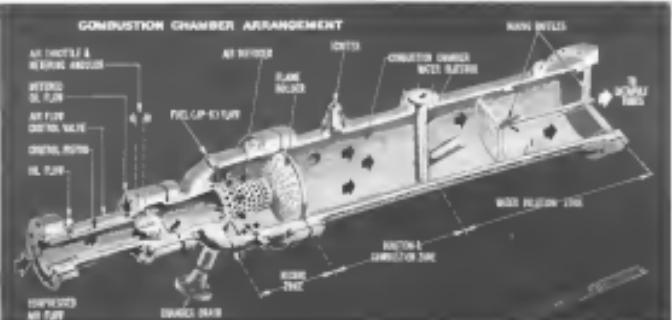
Another problem is that the reactor of the Navy's proposed nuclear-powered carrier will not develop the approximate 800 psi of steam pressure required for catapult operation. Therefore, a program is under way to develop catapult powering systems independent of the



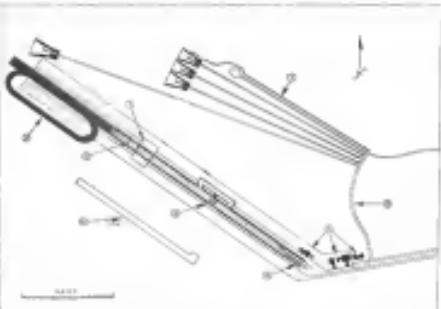
JET CAR, powered by four J33 turbojets, pushes cloud load at 80,000 ft to speed of 375 ft for testing strength of pressure, goes Car [near] stops and load cracks into pieces.



FIVE TRACKS are planned at Recovery Station Test Site and one (right) already is in operation. In a 3,000 ft. long test site (the last miles besides makes construction), there will be 7,369 ft. long and the last will be 12,689 ft. long and capable of test speeds up to 250 mph. It is believed peak on site just now will be used in trials to push deadbolts in marketplace aircraft maintenance gear systems.



REACTION MOTORS: I think Constance Cattell-Dewey's point is shown in this drawing for the first time. Compared as often as left, right, with F & S' law of strong cleavage and against. Water sprayed into the solution through nozzle at bottom left, with a band of breaking F & S' equil. capsule and it dissolved to complete holes through spraying at right. Device was required to follow the CCA rule of "no holes" (see Health-Amer., Feb. 19, '33).



LAYOUT of Naval Air Test Facility (Ship Installations) at Lakewood NAF. Facility includes: (1) Recovery Station Test Site with five jet car tracks, (2) 5,000 ft runway with 4,000 ft extension of upper left, (3) Recovery Assisted Landing Site, (4) C13 and C14 catapult installations, (5) Short Field Interceptor with return track, (6) High G test facility, (7) Research laboratory (portable) awaiting test rate site, (8) Powerhouse, Special Projects and Engineering buildings, (9) Aircraft two bay.

ons powered by old model aircraft jet engines will guide deadbolts of aircraft weight at high speeds. At a predicted normal point, the organs are sent down and the car spar will be broken to a stop. The deadbolt barrier rate is an existing table at a velocity equivalent to a plane's landing speed in test for the necessary distance. Dual center-mounted dual track guides are used and deadbolt units are mounted.

One powered rail, very similar to the first. Certain crowning modifications made in the car make its components more accessible, surviving its main usefulness. Company is also currently responsible for operation of the track at NATF which has a capability of 275 ft with the 50,000 ft deadend.

Other track units are under construction.

There will be 1,300 ft of mag and track and 700 ft of catapult which will have 200 ft deadends. Last track will be 12,600 ft long and will have a 250 ft capability with the same 30,000 ft deadend.

Recovery System Test Site will be used exclusively to test arresting gear systems. Jet cars will also be used in park capture, unanchored aircraft with the recovery system to evaluate their

powered rail, very similar to the first. Certain crowning modifications made in the car make its components more accessible, surviving its main usefulness. Company is also currently responsible for operation of the track at NATF which has a capability of 275 ft with the 50,000 ft deadend.

C14 Catapult

Although the C13 is a C14 catapult, both coverage digits on the rail end power of the runway 4,000 ft away.

C14 catapult is also being built by IBM, but the engine powering it will be RMA's second lateral combustion catapult powerplant. To generate the energy needed to launch a heavy jet, the powerplant consists of two steam

compressors with actual turbines under circumstances which cannot be duplicated with deadbolts.

Test site for catapult systems is being built at the southeast end of an already-completed 5,000 ft runway. A 4,000 ft extension to the southwest is being prepared.

Reason for building a new runway is dependence of existing landing facilities of Lakewood was that runway lengths might not be adequate to handle some of the newer planes. Also, the Navy did not want to charter up a new, unpatented area field with catapults and arresting gear.

Catapults are put at the end of the runway rather than on the present system test site so that, if one fails, the other still can be used.

Currently under construction at the runway are walkways for two catapults. One is a standard steam-operated C13 unit being built by the E. W. Bliss Company. Feature of the C13 catapult facility is that the entire length of the catapult (about 750 ft) is elevated above the runway level. A fixed ramp leading to the catapult unit allows planes to turn in to be launched into place. A run will sweep at the launching end of the catapult. When in place, allows a plane to roll down to runway level again. If removed, however, it opens an foot deep at the fixed end of the catapult to simulate the elongated form a carrier's bow. This will allow planes that have a tendency to roll, somewhat after launching to complete this maneuver on the C13 catapult facility up to a distance of six feet.

C14 Catapult

Although the C13 is a C14 catapult, both coverage digits on the rail end power of the runway 4,000 ft away.

C14 catapult is also being built by IBM, but the engine powering it will be RMA's second lateral combustion catapult powerplant. To generate the energy needed to launch a heavy jet, the powerplant consists of two steam

or large quantities without removing it from its holder or nuclear reactor.

The relatively small reactor is cylindrical, measures about 15 ft in length and has an overall diameter of approximately 24 ft. To produce power for the catapult air is compressed to a pressure of 1,000 psi and introduced at the small end of the power plant. Air is directed to a mixing zone through a perforated air exhaust. JP-5 fuel is injected into the mixing zone through several nozzles located around the nozzle around the powerplant. JP-5 fuel is used to rapidly heat air and is directed into the center for jet plants.

Catapult Operation

The fuel/oil mixture passes from the mixing zone to the injector and combustion zone through a flame holder and is ignited by an electric spark. The very hot flame impinges on a water jacket in the center of the circular chamber. Water sprayed through nozzles in the injector is instantly heated to steam by the intense heat. Steam passes through the water dilution zone, which contains two sets of mixing nozzles, then is directed to the catapult tubes.

Steam performs the dual role of greatly increasing the mass of the projectile and also cooling it before it enters the catapult tube to move the aircraft down the incline.

A major difference between the C13's and C14's operation is that the latter generates power as it is needed instead of drawing on power (latent) stored in large accumulators. Powering during the C14 is to generate power evenly to provide a constant rate of acceleration to the plane being launched to keep C forces at a minimum.

Extending 400 ft down the hangar end of each catapult are inclined sledges below the surface of the runway. These will be used with friction type brakes to stop deadends fired by the catapult drivers. A family of deadends will be available, weights ranging from 10,000 to 100,000 pounds.

Catapults will be used to jump other deadends or planes, depending on how long conducted.

At the 4,000 ft midpoint of the runway, construction is under way as a Recovery Assisted Landing Site (RALS) which will be used to test and evaluate arresting gear systems, including engine and launcher. Barometric air sensors drives nearly same arrangement of nylon webbing—and a jib holding to hold a plane in case it fails to engage the arresting gear. They are not the same as the sole barrier for safety used in carriers.

RAALS includes a large substantiation room capable of accommodating jet or racing aircrafts of the Mach 2 type and



RECOVERY SYSTEM TEST SITE Artist's drawing shows jet car stopped (center) as deadbolts haul into arresting position (left). Arresting engine is in dock (background). Webbed carts in trailer are protected from whipping of broken cable by safety restraint.



FACILITIES at Southeast end of 8,000 ft runway include, left to right: C14 or jet car catapult deck with runway; C13 steam catapult deck; jet sheet runway (outer removable ring indicated by arrow); and powerhouse on which is mounted a control tower.



RUNWAY ASSISTED LANDING SITE Artist's drawing shows under-construction installation of four Mk. 7 Mod. 2 arresting regens with space for two more. At right is diversion strip for rapid landing operations and RAALS control tower. Major landing system is shown at left.



POWDERHOUSE Powderhouse is shadow field. Aerial photo (right) shows C13 steam catapult deck and C14 steam catapult construction progress. Note how C13 installation is raised 6 ft above runway.



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size. A Mk. 7 type arresting carriage at air layout is approximately 6 ft wide, 7 ft high, 90 ft long, weighs 60,000 lb and costs about \$190,000. A complement of six is usually installed on a carrier.

Four Mk. 7 Mod. 2 arresting gear units, the model currently being used aboard carrier-based aircraft, are being tested on RALS. Two additional gear units will be added when required.

RALS is located on several coast-line landings in quick succession—various sections take place about in 20 sec and arrests can be duplicated by RALS by moving a plane at a slow trim up to the right of the runway immediately after it has been damaged from the arresting gear to allow succeeding planes to land. It is this quick succession of landings that puts the severest strain on arresting cables and gear system since the deck is tilted during the landing of the engine. This is particularly true if normal maximum power usage in the same was instead of distributing engagements over the entire available.

Rapid successive landings cannot be duplicated on the pit or recovery track because it is impossible to fit the dead load and return them in the upper end of the track fast enough to simulate 20-second interval landings.

* Arresting gear systems must be evaluated with strict regard to give realistic performance data and to show that they are indeed planes of equipment equipped. Reasons is that the arrested gear acts as a spring while the arrested gear also uses with a structure that has a certain amount of give, and is equipped with bending gear struts that permit collapse upon landing. Detonators made of heavy steel 1 inches wide and rugged and robust on sabotage which are triggered when gear deflates resulting in an accurate gear's operation.

RALS is a purpose-specified installation, does the number of landings could land one in four other three, depending on wind conditions, and still have 4,000 ft left for a ground-around if necessary. When the total takes 4,000 ft are built on to the runway, there will be 6,000 ft available northeast of the RALS.

Big Powerhouse

A large powerhouse is being erected adjacent to the northeast end of the runway to supply power to the steam and air compressors.

Steam for the C1 catapult will be supplied by four high pressure turbines which will produce 30,000 lb/in² at 1,200 rpm. These turbines' outputs will be used to operate the catapult.

Each boiler will supply low pressure, utility steam.

A compressor plant within the power-

British Exchange Program

U. S. Navy spokesman have high hopes for the Army's "development of Project Runway" and the exchange program which has allowed this country to develop them to the extent that the set."

Among the British concepts which have been fundamental in improving the operational efficiency and safety of high performance aircraft flying from carriers are angled deck arrestor systems and marine landing orders.

Carriers will supply regenerated air to the C1 catapult.

Two large steam turbines of 7,500 hp each will drive a three-stage air compressor to provide the quantity of air required by the C1's initial Classification Category propulsor. Turbines are being supplied by Westinghouse, compressor by Carrier under subcontract from Babcock & Wilcox.

On top of the powerhouse will be a small control tower which will be used primarily to control action at the east catapult and RALS sites. Arrestor flying deck is out of NATF's control, will be controlled by the regular Lakelhurst tower, at least for the time being. A guidon exists between the Lakelhurst tower and the new landing strip.

An instrumentation shop and photo lab will also be included in the power house.

Special Projects

A Special Projects Building is being erected on the service leading to the landing strip and catapult. It will house NATF engineering and administration personnel and will house longer space. Latte will be used to project aircraft for test until relationships exist and stable and the like. Building will be used to conduct test equipment and provide facilities for experimental and repair shops.

Ground facilities at NATF include liaison between Lakelhurst NATF's airfield and the 6,000 ft runway which has been completed. It permits planes to land at the base's airfield and taxi to the catapult in case the NATF runway is taxed up with experimental work.

A heliport justing the southwest end of the runway with the Rotary Service Test Site is nearing completion. An access road has been built between the Naval Air Station and the Research Service Test Site and is needed to permit the first test which is now in operation.

Most of these projects have been funded under appropriations totaling \$21,725,700.

Several additional facilities, as yet

unfunded and totaling \$13,764,000, are being planned for NATF.

Most important single item is the High-G facility, which alone is budgeted at \$9.8-million.

A 7,000 ft runway parallel to but south of the 8,000 ft runway will be the site of the proposed facility. Its purpose, Code Taskord said, is to duplicate the kinds of forces which can be expected on combat beings and impact damage, deck, catapult launching and arrested landings.

Carrier flight deck length has been increasing only a little compared with previous predecessors, so there is a growing need to push planes harder to get them airborne safely.

Landing with current catapults take about two seconds during which planes are subjected to a maximum of about 3 Gs.

If pilot, plane and an equipment could withstand doubling these forces, airplane makers would have considerably greater leeway in designing high performance aircraft than this narrower field of study.

Purpose for having a 7,000 ft long runway is that the Navy wants to be able to catapult a plane up to 100 ft and keep him under observation for 15 seconds to see whether he is capable of flying on implants after having been subjected to a given number of Gs. To accomplish this, a slot capability by jet engines will be used. Jet engines will largely substitute thrust after the initial catapulting.

If the High-G facility is the pilot's ability to fit the plane satisfactorily after launching, the Navy may be compelled to develop some means of controlling a plane's first few moments of flight completely automatically to give the pilot sufficient time to recover before taking over the controls (AW Aug. 19, p. 23).

Additional Facilities

An additional facility planned is a 4,000 ft extension at the northeast end of the runway which will be used specifically to test the feasibility of sheet metal installations.

If 4,000 ft runways can be built to handle high performance jets successfully without the 13,000-14,000 ft runways now required, much money and time could be saved.

The Sheet Metal installation will be used in a development program to test various methods of making such a cockpit cover. Jet will be used to "heat-seal from behind" to help them calculate the strength gain in the rearview's 4,000 ft. No one believes that jet can cause complete and rapid sealing in a simple and effective way to give high performance planes the extra boost they need to take off at short distances. Jet can, being behind the aircraft will have

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to be designed to arrest or deflect the aircraft jet blast at the plane gashors speed during an ejection.

A new track-like loop bolted handle the runway will allow the jet car to roll along the track until it has built up an initial velocity as required. After two or more jet car runs, operate word breakers with some retarding while others are launching if short interval take offs are required. Jet cars will be guided by tracks and controlled manually from center of loop.

Portable Gear

An Engineering (portable) Arresting Gear Unit is being planned for the last part of the \$500,000 to remove the need for a permanent arresting gear though to determine the most practical configuration.

An engineering building is being planned to take care of anticipated expansion of engineering requirements of NATF.

Guido Tassell noted the planes and projectiles he needs to maintain agreements to cover the weight and take off and landing speed requirements of current shipboard aircraft. He emphasized that this is just an initial list and of necessity was flexible, it can and will change in time passes. The list is:

- Douglas AD-6 (R1518)
- Grumman TE-2 or S2F-2 (R1810)
- Grumman F9F-5 (445)
- McDonnell F4H-2N (71)
- North American AJ-1 (over R2500), one (33)
- Douglas A3D (two) (576)
- Douglas A3D (651)

Research system test site facilities are currently being operated by All American Projects Inc., presented. Test-sites are located near a bridge supported by a thick earth embankment. Platforms are taken off and the arresting cable should swing and whip around the massive arms.

Deadload Test

After the initial run-down, a cloud of dust at the starting end of the track shows that the car's four jet engines are running. Hand acceleration pushing the 25,000 lb. aircraft/gear system speed and when it reaches 100 ft. per sec. at the end of the runway the jet engines are automatically shut down and the jet car is "broken" to a smooth stop by spring loaded friction plates clutching the ground. It comes to a standstill in the center of the track. The deadload features post at over 100 ft. per second withstanding an air pressure of 100 psi. At the end of the deadload ejection the weight of the aircraft was arrested about three feet above the track. The 20,000 lb. vehicle silently slows to a stop in less than

200 ft. by the Mk. 7 Mod. 3 arresting cable fastened to a metal shack at the right of the track.

The Mk. 7 Mod. 2 ejection, which the Navy is testing at NATF, can dissipate 500,000 ft-lbs. of energy. The Mk. 7 Mod. 1 unit, now in service with the fleet, dissipates 24-million ft-lbs. of energy.

This is how the arresting cable and carriage are set up. The product is standard across the deck and is attached to the purchase cable which runs through sleeves in the arresting cables and is raised several times before it

is lowered to the deck.

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This is how the arresting cable and carriage are set up. The product is standard across the deck and is attached to the purchase cable which runs through sleeves in the arresting cables and is raised several times before it

is lowered to the deck.

Completion of all these efforts and so involves in our working on NATF under Guido Tassell. Personnel and budget plan call for an expenditure of \$630,000 in Fiscal 1958. By the end of Fiscal 1958, over months from now, personnel should expand to 200. By the end of Fiscal 1959, personnel should increase to 350 and budget to over \$1,000,000.

Ground-breaking at NATF took place in February, 1955. Official commissioning of the facility has been expected for October 1 of this year.

Spokesmen estimate that the 1,000 ft. runway and C13 and C14 catapults will be in operation by the summer of 1958 and the test area made at the Research Station. The Site will begin functioning in the fall of next year.

Operating at NATF will involve the initiation and coordination of work of Naval Air Development and Material Center Johnsville, Pa. Management and technical control is exercised by BuAer.

The new unit will be independent of Naval Air Material Centers even though both will be seeking an experts of the arresting gear and catapult programs.

Logistic support, cost and fine planning, overhead and route fiscal controls, maintenance, breakdowns, wire control references, and standard facilities will be provided by the Lieutenant Naval Air Station.

OFF THE LINE

Cannady Corp. received a production order from the Navy for the design and manufacture of an F31-37 parachute train. Birth of the train will be governed by December 1958. Operational Flight Trainer modifications began last month and will be completed by the F31-37 production train. This is probably the last note that an obsolete controller has given new life to a parachute train, resulting in substantial savings money.

Cannady has acquired 11 acres of land near the Buffalo, N. Y. Municipal Airport and hopes to move into its area 15,000 sq. ft. plant being erected there before the end of the year.

Rosenblatt Corp. has merged Eastern Atlantic Manufacturing Co. of Atlanta, Ga. warehouse, distributor for the states of Alabama, Georgia and Florida. Eastern Atlantic will handle such Rosenthal products in Phoenix. T. T. Rosenblatt, president, planned the merger.

Rubber-deicing unit from propeller and wing leading edge, aircraft manufacturers or military has been put on the market by the French firm Kleba Collec-



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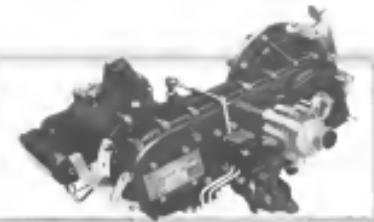
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bus. Called Altimeter, the rods are heated by electric resistance wires buried in the rubber. Metal can be forced to almost any contour.

A new, lightweight, expendable pulley made of wood and reinforced plastic has been developed by Roffing Industries Co., New York City. That measures 40 x 48 in., can handle loads up to 4,000 lb. and costs less than \$1. Weight is 14 lb compared to 35 lb. for a wooden pulley of the same size.

Machinists Division, General Mills, has doubled its research and development programs during its last fiscal year which ended May 31. Its products and services, which include aircraft and missile drives and avionics, automatic controls and plastic stabilizations, were added during earlier government contract. During the same period, company's total sales were \$357,750,000, \$31.6 million above last year's sales figure.

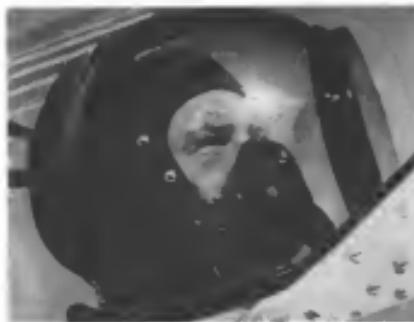
Realty-paying licensing agreements have been arranged between five of the country's large assault hose fitting and manifold manufacturers. Under the agreement, Aerospac Corporation, of Jackson, Mich., will receive a license to manufacture hose fittings, has been granted rights to produce and sell a new, permanently attached type of fitting incorporating rubber patches and various applications held by The Wellerhead Co. of Cleveland, Ohio. The fitting features a patented hinge gripping principle and a seal with Teflon base. Wellerhead received rights to produce and sell Aerospac's "Super Gait" reusable fittings for Teflon hose which incorporates a liquid-proof cap. Both licensing agreements cover the United States and Canada. It will be a dual source of supply of both permanently attached and detachable fittings.

Design and development contract valued at \$146,000 for an electronic printing machine has been received by Pan-Chi Copier Equipment, Inc. from Rockaway Air Development Center, Griffiss AFB, N. Y. Machine will accept slides, serial photographs, which it will convert into printed images. It runs nine "originals" at 900 lines per inch at a speed of 500 lines per minute and can incorporate enlargement or reduction.

William Band & Company, Inc. of Wilmette, Conn., has appeared in exclusive sales representative for their Teflon Multiductor Cable, the Los Angeles firm. Cables are custom designed. Teflon State Model Blvd. Multiductor cables are used in various computer, data processing, missile and television applications.



THREE Soviet pilots examining pressure suits which are similar to comparable U.S. suits



WHAT is probably only model high altitude gear includes leather helmet, oxygen mask



DETAIL of Soviet high altitude head gear

Pressure Suits for Soviet Pilots Have Similarities to U.S.

Details of interest? Recently high altitude pressure suits are evident in these first pictures to reach the U.S. Soviet pressure suit similarities to American suits (upper left). Suit worn by man kneeling has very noisy pants in comparison with a USAF design. It is possibly a Russian copy or even a captured Air Force suit. Other two suits are obviously full-pressure garments with some resemblances to the Goodrich suit (AWW July 1, 1957).

Note socks at wrists where gloves meet an Unusual end on right elbow of full pressure suit (center) suggests the wearer must maintain electrical connections for head sets, radio, etc., and possibly, but not necessarily, the oxygen supply.

Raised slings about the left knee may be pressure sewing device to inflate seat somewhat in an emergency.

Close-up Soviet pilot (above) shows detail on hinge of helmet and of what appears to be a latch just below the oxygen tube. The flexible arm secured to the side of the helmet looks as if it could be safety for padding to protect the back of the pilot's head.

Picture of pilot descending basket (left) shows that oxygen tank is worn under his helmet, but his head would probably still be pressurized.

Closeup of pilot in cockpit (right) shows his face in leather helmet. He appears to be wearing a cloth or leather jacket.



Pilot descending basket from cockpit carries oxygen tank in left hand which is probably a cloth or leather jacket. It is not the crash type to protect his head made fibrous. Boots appear to be leather and unusual in comparison to Goodrich-developed boots



Soviet high altitude helmet is similar to USAF type MBS.

oxygen mask and large glass helmet with sound face plate, is probably an initial step in pressure suit development.

U.S. experiments several years ago with full-head type of helmet, in which helmet stays still and pilot's head moves freely inside, proved up these objections:

- Star kept pilot from being able to get his head close to sides of the cockpit and he could not rise on his seat to get required field of vision to fly in aircraft.
- Anesthetized were bad because of the helmet shape.
- Vision was somewhat distorted.
- Fogging was very bad without oxygen mask, was still objectionable when mask was used inside the helmet as shown in these Soviet patterns.

Although the Russian suit is full pressure, it is difficult to say whether it is partly a mechanical problem just as USAF's isn't, where Sheldan press just against the skin or an pressure suit as in Navy's Goodrich and Arrowsmith garments where air between skin and the

suit and man's body carries the pressure on the skin.

Way the Russian suit features together by the front of the two indicates that what is visible is an outer garment with a pressure shell underneath.

Anonhead suit says one ball bearing size where helmet attaches to the suit, has bellows for elbow, wrist and knee joints. Goodrich uses five ball bearing points which appear to be used at neck, segments and wrists. Both now under development and ball bearing seems to be of the work.

Russian suit seems to avoid the ball bearing problem.

Some belief of U.S. suits give adequate chin protection for the head, but the Russian suit shown in these patterns

Soviet high altitude helmet, shown in this photograph obtained in America's Work, is very similar to the USAF type MBS, now a limited stand and helmet in this country. Visual check of Russian model is very good and is superior to the MBS, but is not equal

to current Air Force helmets under development.

Existence of this equipment implies use of aircraft with operational altitude capabilities of 30,000 ft. or more and a good understanding of the planning and requirements involved. With an adequate pressure suit, the helmet would provide physiological protection to extended altitude. Positive altitude insurance cannot be obtained from the majority of the human alive.

The Soviet helmet appears to be a full pressure suit which probably ends at the neck. This is indicated by such features as a headband cable assembly to prevent it from being folded upward, and a lack of oral/nasal mask or face seal. The oxygen inlet hose indicates that a pressure-demand breathing system is probably used.

Pilot's view is probably removable. No microphone is visible.

Weight of the helmet is probably about 10 pounds. It is not equipped with quick-disconnect provisions and probably requires a minute or longer to put on with removal assistance.

In the picture, the pilot is wearing some sort of suit under his leather jacket as evidenced by the closed upper and balaclava sleeve. However, this does not appear to be a full pressure suit because of the lack of belt in the shoulder area. More probably, it is some type of emergency suit such as a para-pressure or bladder-type suit.

USAF Contracts

Following is a list of unclassified contracts in \$70,000 and over as released by Air Force Contracting Office:

AIR FORCE RESEARCH FIGHTER TEST CENTER, AIR FORCE AIR AND SPACE FORCE

Research Center of Boeing-Vertol Corp., Seattle, Wash., has been awarded the sum of \$1,000,000 for the use of research laboratories in state-of-the-art helicopter development. Contract AF 33(65)-1000, 401-220.

DATA PROCESSING MATERIALS

AFSC-L-1-2, Radio & Electronic Components Directorate, Research & Technical Division, AFSC, Wright-Patterson Air Force Base, Ohio, has been awarded \$1,000,000 for the use of facilities involving DPPR-101, 14, 16, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 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COMMISSION, 1000 Lafayette, Colo. 80202.
ARMED FORCES AIRSHIP DIVISION, 1000
Lafayette, Colo. 80202. (PPD-110-2)

ARMED FORCES AIRSHIP DIVISION, 1000
Lafayette, Colo. 80202. (PPD-110-3)

ARMED FORCES AIRSHIP DIVISION, 1000
Lafayette, Colo. 80202. (PPD-110-4)

ARMED FORCES AIRSHIP DIVISION, 1000
Lafayette, Colo. 80202. (PPD-110-5)

Navy Contracts

Following is a list of classified contracts for \$25,000 and over, as released by Navy Contracting Offices:

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202.

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-6)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-7)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-8)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-9)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-10)

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ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-14)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-15)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-16)

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ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-18)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-19)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-20)

ARMED FORCES AIRSHIP DIVISION, 1000 Lafayette, Colo. 80202. (PPD-110-21)

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WHO'S WHERE

(Continued from page 21)

Changes

Charles J. O'Donnell, general manager, Remanufacture Systems Division, Fauchier Coarse and Instrument Corp., Springfield, N.Y.

Robert A. Wolf, land-renter, research department, and Dr. David A. Kohn, land-renter, research department, Systems Division, Defense Components Division, Lockheed, Buffalo, N.Y. Also Maurice M. Knoblauch, land-electronics department; Walter F. Engoff, land-airframe mechanics, and King D. Reid, land-instrument research.

Frank M. Schubert, chief engineer, Gandy Corp., Buffalo, N.Y. Also Dr. William B. Lyman, director, newly established training department.

Siegfried Holdaway, engine sales representative, for western Europe (Montagu Corp. Inc.), Los Angeles Division, Avco Mettalic Casting Corp., Hartford, Conn.

George C. Price, manager European sales office, Gossen, Standard & Company, division of General Dynamics Corp., San Diego, Calif. Price will be joined by Rolf D. Cope, Philip Wind and Theodore Liles.

J. M. Barr, general manager, See Perseus Electric Manufacturing Co., See Perseus, Calif.

Ray C. Cook, land-applications engineer, and Dr. John S. Bonnerup, Inc., Calif. City, Calif.

H. N. Beverage manager Electronics Department, Aerospace Development Corp., subsidiary of Curtis-Wright Corp., Santa Barbara, Calif. Also Robert H. Halperin, capacitor section support project engineer, Aerospace Division, Curtis-Wright Corp., El Segundo, Calif.

Charles G. Neighbors, Jr., continental verifying and pilot editor, Gitter Hi devices, Inc., Ithaca, N.Y.

Gordon Ladd, chief engineer, Pictures Engineering Corp., Santa Monica, Calif. Ladd has been promoted to the management of America Sales, Cities Service Pictures, Inc., New York, N.Y.

John Radio E. Douglas, field sales manager, Glas-Elasto Products, Inc., Cleveland, Ohio.

Edward A. Wolf, manager-super products department, Aviation Products Division, Goodrich Tire and Rubber Co., Akron, Ohio.

Mark E. Sorkin, manager, Electronics Division, Asia Pacific Products Co., Philadelphia, Pa.

Leonard E. Kent, chief engineer, cap area, The Narda Microwave Corp., Matawan, N.J.

Howard S. Glazman, assistant general manager, Electronics Division, Standard-Cast Div., division of Central Division, Corp. Park, Englewood, N.J.

Cliff N. Wilkinson, chief engineer, General Engineering Division, Avco Products Co., Middle River, Md.

William N. Hill manager, Avco Avionics Division, Flight Control Technical Services Dept., Farmington, Maine, Avco Corp., Farmington, Maine.



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